



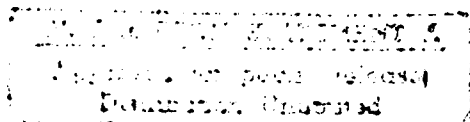
PRODUCT PERFORMANCE AGREEMENT GUIDE

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THE
AIR FORCE

PRODUCT PERFORMANCE AGREEMENT CENTER

ASD/ALW - AFALC/XRCP

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The Product Performance Agreement Guide

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FOREWORD

Federal Law requires a warranty (Product Performance Agreement) be considered on all weapon system production contracts. The Product Performance Agreement Guide introduces the acquisition team to Product Performance Agreements (PPAs). PPAs are used to comply with the law, and as incentives to deliver more reliable and maintainable weapon systems at a lower life cycle cost.

The Guide provides some history of PPA usage within the Air Force, introduces The Product Performance Agreement Center, presents an overview of the decision process for PPA evaluation and selection, and illustrates the emphasis on PPA administration and management.

Comments on the guide are welcome. Suggestions for improvement, or descriptions of PPAs not covered, should be sent to HQ AFALC/XRCP or HQ ASD/ALW, WPAFB OH. 45433-5001.

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GLOSSARY OF ACRONYMS

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EXECUTIVE SUMMARY

OBJECTIVES

Product Performance Agreements (PPAs) are required to be considered, for weapon system production contracts, by title 10 section 2403 of the United States Code.

The objective of a PPA is to deliver an effective and available weapon system to the Combat Commander by providing the system manufacturer with a suitable incentive to assume increased responsibility for post delivery performance. PPAs normally provide financial incentives -- positive and negative -- in order to motivate the contractor to deliver reliable and maintainable products. The Government should not be paying a second time for performance we reasonably expected to achieve under the basic contract. Actually the PPA provides specification enforcement when system field performance is below what was required. Pricing the PPA is used to assess cost effectiveness and to monitor the expected cost increases due to the contractor's additional risk.

The objective of this guide is to provide the acquisition team with basic information about the PPA process.

The concepts in this guide are not new. Many are currently applied in varying degrees to products in both commercial and military environments.

Although this guide focuses on using PPAs, other contractual strategies are available, and should be explored, to supplement and complement the PPA concept. These are:

- 0 Award fees,
- 0 Second sourcing,
- 0 Cost sharing,
- 0 Multi-year contracts, and
- 0 Value Engineering.

THE ROLE OF THE PPAC

The Product Performance Agreement Center (PPAC) has been established to assist the acquisition team in the use of PPAs.

The PPAC has the required analytic tools to provide the program team the necessary information to make judgements regarding PPA selection, assessment, application, and management. These tools are discussed in SECTIONS 4 and 5.

For more detailed information, assistance in developing a PPA provision, or in developing the management techniques for a PPA contact the Product Performance Agreement Center, WPAFB, OH. 45433-5001 or AV 785-5042/5459.

OPERATIONAL CONCEPT

Figure 1 shows the overall operational concept of the PPAC. The center was designed to integrate all PPA activities within the Air Force, and be the Air Force/Industry PPA interface.

To facilitate the PPA decision process, the PPAC supports the acquisition team as depicted in figure 2. SECTION 4 describes the PPA selection, analysis, and structuring techniques found in the Decision Support System.

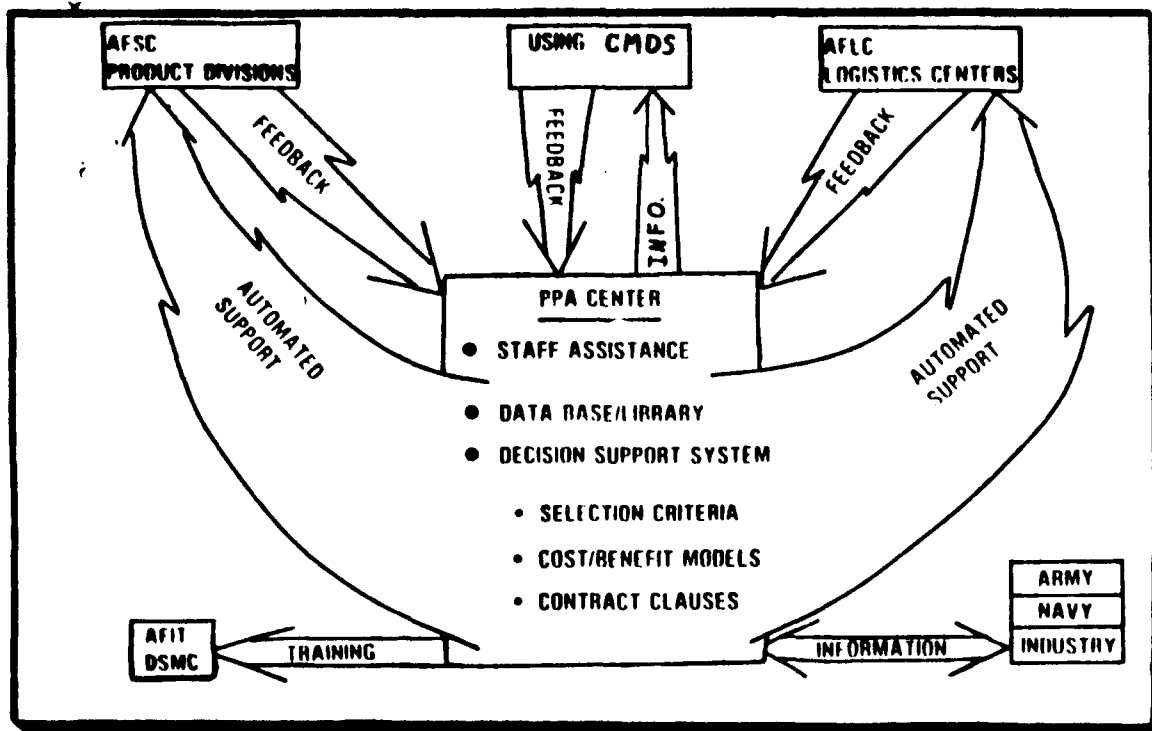


Figure 1 PPAC Operational Concept

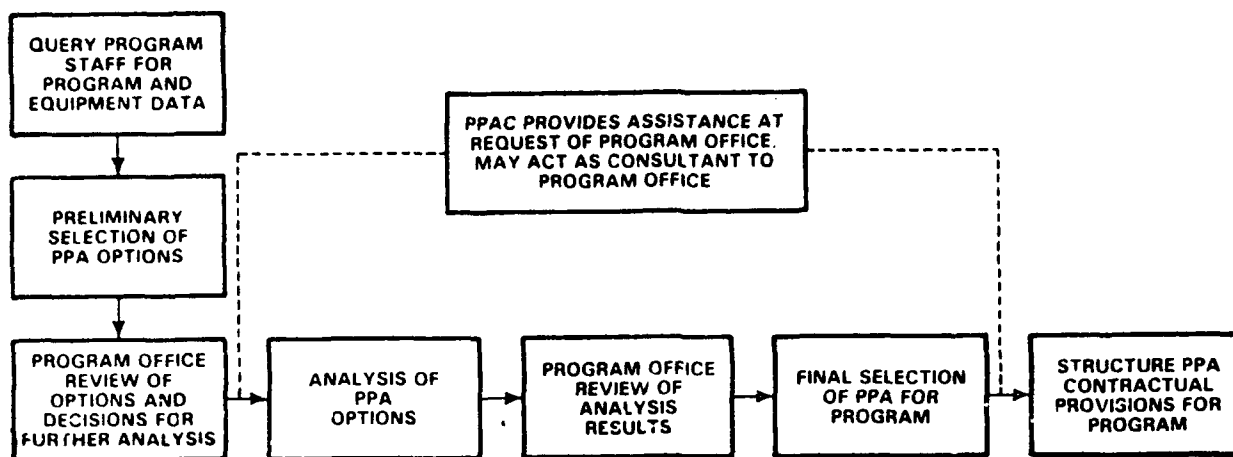


Figure 2 PPA Decision Support Concept

CONCERNS

Since 1973, when the DoD began its trial program for the Reliability Improvement Warranty (RIW), there have been three major concerns in the PPA area;

- Whether warranties, guarantees, or incentives are cost effective. (see SECTIONS 3 and 4)
- PPA application guidance. (see SECTIONS 2, 3, and 4)
- PPA management. (see SECTIONS 2 and 4)

When the warranty statute, 10 USC 2403, took effect in January 1985; it generated another concern. The requirements of the law are discussed in SECTION 1.

OUTLINE

The PPA Guide is organized as follows:

- SECTION 1; PPA HISTORY;
Reviews PPA history.
- SECTION 2; PRODUCT PERFORMANCE AGREEMENT
CENTER;
Illustrates the role of the Product
Performance Agreement Center in the
Acquisition Process.
- SECTION 3; PPA EFFECTIVENESS;
Demonstrates the effectiveness of PPAs to
increase reliability and maintainability,
and lower life cycle costs.
- SECTION 4; PPA SELECTION, ANALYSIS, AND
STRUCTURE;
Identifies approaches, criteria, and
analyses, to PPA selection and structure.
- SECTION 5; PPA MANAGEMENT;
Illustrates the steps to, and tasks of,
effective PPA management.
- APPENDIX A; Product Performance
Agreements;
Lists most of the currently used types of
PPA.
- APPENDIX B; Typical Clauses For Typical
Situations;
Contains generic clauses.

1.

PPA HISTORY

1.1. APPLICATION HISTORY

The first airplane in the DoD inventory was purchased with a positive incentive Product Performance Agreement (PPA). The Wright 'B' Flyer exceeded the design specification of 40 MPH sustained speed and the Wright Bros. received an incentive fee.

1.2. COMMERCIAL AIRLINE PPAs

Warranties are a firmly embedded practice in the airline industry. A recent survey showed that each airline had virtually identical warranty application and management objectives. Basically the airlines:

- Obtain warranties on as many items as possible,
- Strive for relatively uncomplicated (to the airlines) provisions, and
- Aggressively manage the warranty throughout its contractual life.

Civilian consumers seek warranty coverage as a means of financial protection against premature failure and/or substandard performance. The Government extends the insurance policy aspects of consumer warranties by using PPAs to enforce performance specifications.

1.3. GOVERNMENT PPAs

The military environment is too severe to expect identical reliability results from PPAs without defining their limits and managing them differently. Military transport aircraft avionics reliability, with PPA coverage, compares well with airline experience. Even in less benign circumstances (e.g., fighter aircraft) the benefit accruing from PPAs has been significant, as compared to the non-PPA situation. These PPAs, however, were managed differently from each other and from the typical airline warranty.

1.3.1. The Reliability Improvement Warranty (RIW) Trial

The following excerpt from a 1973 Memo to The Services by the Assistant Secretary of Defense for Installations and Logistics, Director of Research and Engineering recommended a trial period of warranty use (particularly the RIW).

MEMORANDUM FOR
THE SECRETARY OF THE ARMY
THE SECRETARY OF THE NAVY
THE SECRETARY OF THE AIR FORCE

SUBJECT: Trial use of warranties in the acquisition process of electronic subsystems.

In industry extensive use is made of warranties thereby establishing the manufacturer's responsibility to provide a usable and available product during a period of time. To achieve this economically, many techniques have been employed by the supplier (i.e., more reliable products are designed; designs are improved to increase reliability during the initial operation phase; economical maintenance and repair procedures are developed). Accordingly, it is requested that a trial application of warranties be utilized in the acquisition and initial operational support of a number of electronic subsystems to help determine the scope and benefit warranties may have for the DoD, as well as effective management approaches. The warranty approach envisaged (perceived) is one in which the supplier agrees to repair or replace malfunctioning or defective items of equipment during a specified period of time.

Figure 1-1 illustrates some of these programs and indicates the type PPA coverage obtained. While this is not all inclusive, it does depict the broad range of PPA applications.

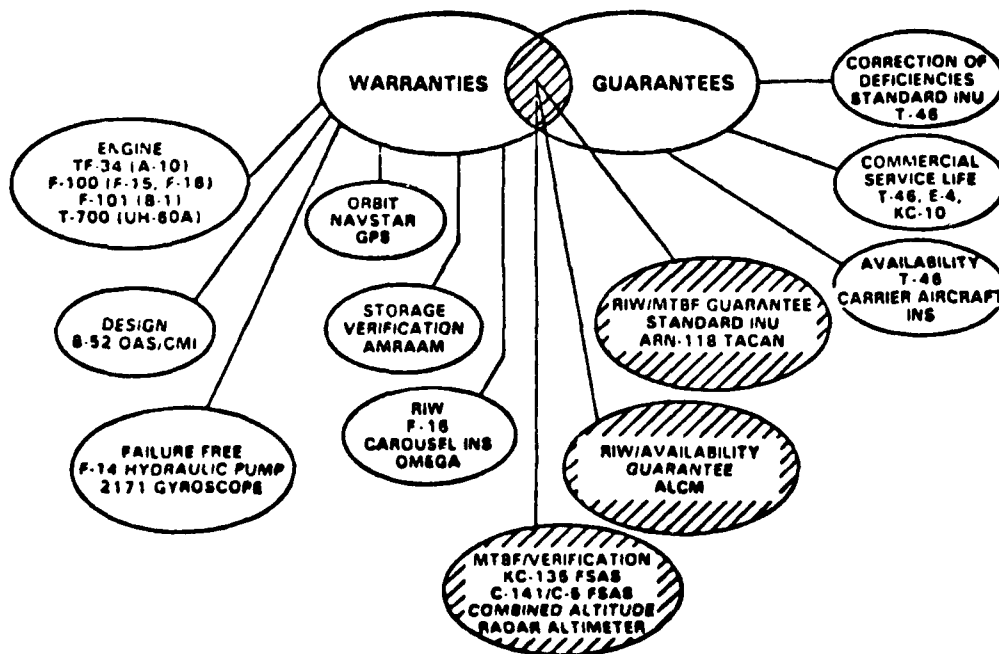


Figure 1-1 Example PPA Applications

1.3.2. PPA Principles

In 1979, as a result of the trial warranty period, senior Air Force and Industry representatives set forth the following series of principles for using PPAs.

- The objective is better product performance in field use.
- There is a need for innovation.
- Better product performance may mean higher front end expenditures.
- Activities to achieve required levels of field performance should be started as early as possible in program life and integrated into the development cycle.
- Competition, or the threat of competition, is strong protection for the customer
- Warranty approaches should be tailored to the peculiarities of the products.
- If a strategy of requiring supplier responsibility is initiated, it should be continued on successive buys of the same product, not turned on and off at the discretion of the Air Force.
- The procedures for establishing and maintaining contractor responsibility for performance of their products must be kept simple.
- Mechanics for feedback to the contractor about usage and failure rates of products must be established.
- Bill back procedures (contractor reimbursement for Air Force performed repairs of warranted items) can be arranged for military hardware.
- Procedures should be developed to allow use of procurement funds during development for efforts related to obtaining better performance in field use.
- For products with strong warranty provisions, Government in-plant surveillance should be reduced.
- Industry should be involved in a Product Performance Agreement Center (PPAC).

1.3.3. The Defense Acquisition Improvement Program (DAIP)

The emergence of the DAIP brought senior level management attention to a series of initiatives designed to enhance management of the acquisition process. Initiative number 16 was

entitled Contractor Incentives to Improve Reliability and Support. The incentives envisioned included:

- Appropriate source selection criteria
- Contract incentive provisions
- Warranties
- Contractor maintenance.

1.3.4. The Warranty Statute, Title 10 United States Code §2403

The written guarantee approach was taken further by the U.S. Congress with Title 10 United States Code section 2403 which states that all weapon systems purchased after 1 January 1985 will have a PPA on the contract. This PPA will guarantee:

- For all weapon system production contracts costing;
 - more than \$100K per deliverable end item, or
 - more than \$10M total procurement,
 - Conformance to Essential Performance Requirements,
 - Conformance to Design and Manufacturing Requirements,
 - Freedom from defects in materials and workmanship.
- That the contractor will bear the cost of repairs, replacement, or reprocurement.

This requirement applies to weapon systems (the Department of Defense Federal Acquisition Regulation Supplement (DFARS), Subsection 46.7, includes major subsystems) in mature full scale production. The essential performance requirements coverage is excluded from;

- The first 10% of the total production quantity, or
- The first year's production quantity, whichever is less.

The Secretary of Defense may waive the PPA requirement:

- For national defense reasons.
- If it is not cost effective. (for the particular procurement at that time)

Waiver notification is required by the House and Senate committees on Armed Services and Appropriations.

The PPAC is a central Air Force office, providing guidance and assistance to managers. This guide was developed as a communications tool to help management and contracting personnel define and clearly express real needs in Air Force contracts.

2.

PRODUCT PERFORMANCE AGREEMENT CENTER

The Air Force Product Performance Agreement Center (PPAC) was established in 1982 to assist Air Force activities involved in the acquisition of defense systems and their components in selecting, structuring, pricing, negotiating, and implementing effective Product Performance Agreements (PPAs) and related business arrangements.

2.1. PPAC TASKS

In order to promote the use of PPAs in Air Force procurements, and to promote effective application and management of PPAs at all levels, the PPAC:

- 0 Serves as the central repository of Air Force PPA related data.
- 0 Analyzes the effectiveness of existing and proposed warranties, guarantees, award fees, incentives, related contractual provisions, solicitation instructions, and other PPA associated contracting strategies and/or management and administration systems.
- 0 Develops improved contract clauses and related concepts as well as methodologies for selecting appropriate and cost effective PPAs.
- 0 Provides technical assistance to Air Force activities in selecting, tailoring, pricing, negotiating, and administering appropriate agreements through:
 - Direct consultation with program/system managers and staff;
 - Periodic publication of guides, handbooks, and/or technical reports and;
 - Periodic sponsorship of workshops, symposia, briefings, and other communications designed to improve Air Force wide use of PPAs.
- 0 Formulates proposed policy guidance for HQ USAF consideration concerning application of PPAs to Air Force acquisitions.

2.2. PPA EXPERIENCE

The PPAC data base contains previous PPA experience on military programs, including:

- Contract clauses.
- Field reliability results.
- PPA studies and reports.
- Interviews with program/system managers.

This information is available to an acquisition team. Examining what has been done, and the relative success obtained, will better inform the team regarding PPAs and their application.

2.3. PPA SELECTION

Specific PPAs are not applicable to all program situations, and the agreements themselves should be tailored to the application. The selection process is sensitive to program characteristics, for instance:

- Equipment function, type, and quantity;
- State of technology;
- Operational use;
- Planned operational life;
- Maintenance concepts;
- Production/Delivery schedule; and
- Type of contract.

Similarly, the agreement objectives listed below also affect PPA selection.

- Reliability growth
- Availability/readiness
- Maximum logistics support cost
- Specified Mean-Time-Between-Failure standards
- Maximum parts cost.

The agreement objectives and the program characteristics must be considered in developing the appropriate PPA, and the most efficient administration and management methods for its application.

2.4. USER SUPPORT

PPAC personnel are trained to use the PPAC Decision Support System, provide technical support, and draft PPA clauses. Upon request the PPAC can provide training and/or training materials.

The PPAC supports and assists the program team in accomplishing the required analysis, and in developing and drafting tailored agreements. The methods used, and the application management and administration tools, are described in Sections 4 and 5. The clauses currently used or considered are described in APPENDIX A. Sample clauses are listed in APPENDIX B.

3.

PPA EFFECTIVENESS

3.1. DEFINITION

A Product Performance Agreement (PPA) is a management tool designed to increase contractor responsibility for the field performance of their product. A PPA provides the Government with contractor incentives for product performance, and reliability and/or maintainability improvement.

3.2. PURPOSE

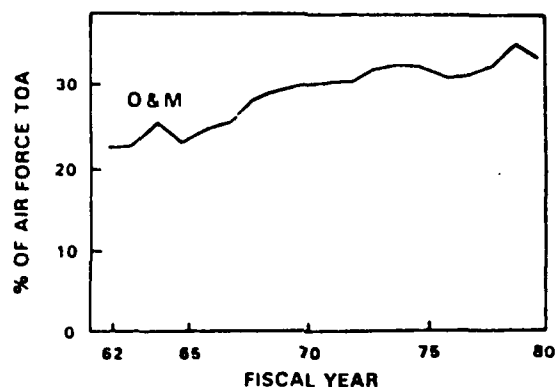
The purpose of a PPA is to:

- Protect the interests of the Government.
- Provide incentives for the contractor to design and produce the best quality product within the scope of the particular contract.

3.3. PPA BENEFITS

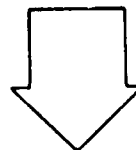
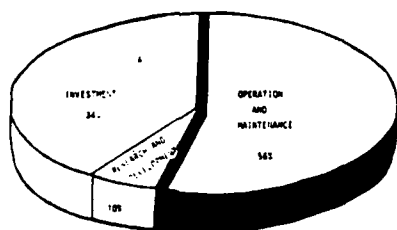
The object of a PPA is to enforce the performance and (when required) Reliability & Maintainability (R&M) specifications. An optional objective of some PPAs is to create a consistent pattern of R&M growth during development and deployment. The target is improved availability during system/item deployment at considerable savings in Life Cycle Cost (LCC). The trend of Operation & Maintenance (O&M) costs, as shown in Fig. 3-1, is an ever increasing share of total system cost. Per unit cost of a weapon system is not the sole criteria of affordability. Total LCC, of which O&M is over 50%, determine affordability. A low reliability and/or difficult to maintain, but moderately priced, item may not be affordable when you add up the O&M costs over the expected system life.

System R&M is a key concern because of its impact on mission capability. The price of modern weapon systems precludes the excessive O&M budget required to insure desired mission capability with less than desired system/item R&M. The maintenance overtime, system cross cannibalization, increased purchases of the bits and pieces to effect repairs, and the increased transportation and administrative costs are reflected in the O&M budget.



- WEAPON SYSTEM RELIABILITY IS A CONTINUOUS CONCERN OF DOD
- O & M COSTS ARE ABSORBING AN INCREASING SHARE OF OBLIGATIONAL AUTHORITY
- PRESENT MODERNIZATION EFFORTS WILL AGGRAVATE PROBLEMS BY INTRODUCING INCREASINGLY COMPLEX SYSTEMS IN LARGER QUANTITIES

SYSTEM OPERATING COST 10 YEARS



INCREASED INTEREST IN WAYS TO IMPROVE RELIABILITY AND REDUCE COSTS

Figure 3-1 Rising O&M Costs

Figure 3-2 is an example of seven relatively low technology avionics procurements wherein the reliability achieved in field use fell below expectations. Lacking the protection of a PPA, the Government was forced to absorb reliability shortfalls which reduced mission capability, and/or increased support costs. A PPA places greater responsibility for system field performance on the manufacturer.

It is difficult to conclusively prove that reliability measures observed on a program employing a PPA are the result of the PPA. The significant difference is that any other measure would cease to be effective with the Government accepting the system/item (the signing of the DD Form 250). With the specification enforcement being extended over time, and to the ultimate user of the system/item, there is a powerful incentive for the contractor to meet the specification over a longer portion of system/item life. Although the data is somewhat limited, the results have been consistent. In general, PPA programs have achieved:

- Higher reliability,
- Mean-Time-Between-Failure (MTBF) improvement/ lower net LCC,
- Reliability growth,
- Improved availability, and
- Return On Investment.

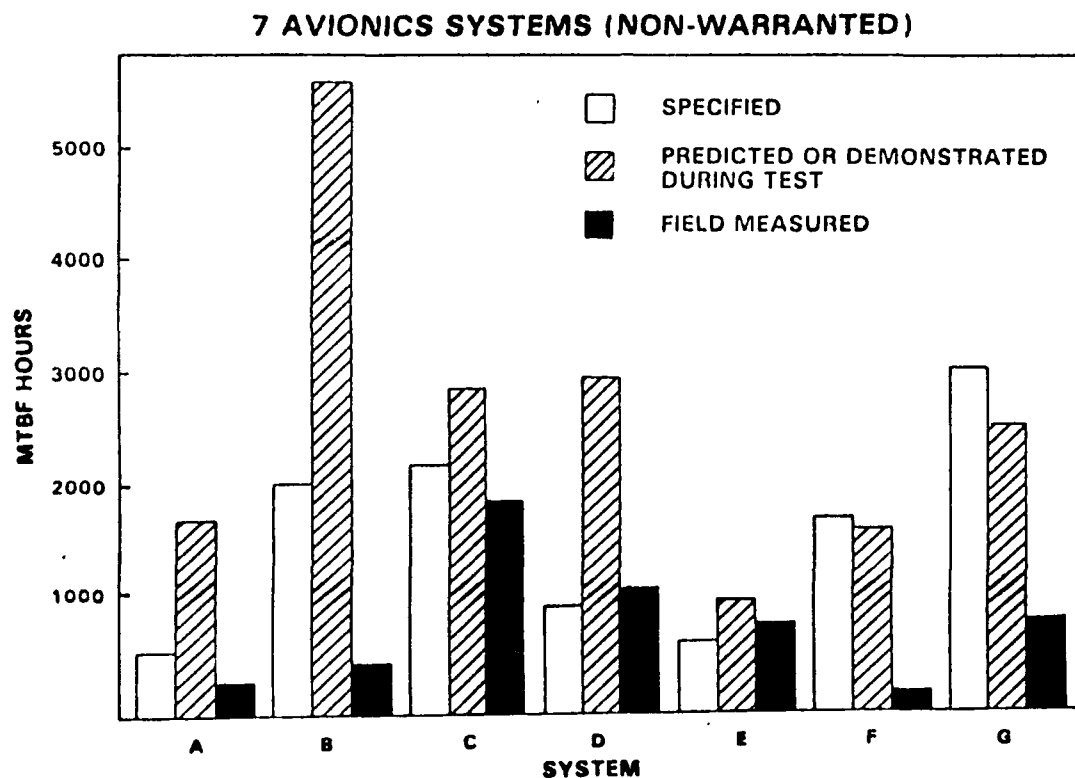


Figure 3-2 Reliability; Test vs. Field Performance

3.3.1 Improved Reliability

The Tactical Air Navigation (TACAN) Receiver/Transmitters (R/Ts) provide an excellent opportunity to compare the results of similar items in a PPA/non-PPA situation. The ARN-118 R/T had a five year Reliability Improvement Warranty (RIW) with an MTBF Guarantee while the ARN-111 R/T did not have a PPA. The units possess equivalent technology and their installation in the same platform at the same time provides a comparison not normally available. Figure 3-3 illustrates the MTBF history, as reported in the Air Force's Maintenance Data Collection (MDC) system (DO56). The reliability of the ARN-118 R/T clearly surpassed that of the ARN-111 R/T over the entire period. The existence of the PPA and the requirements/incentives given to the ARN-118 vendor is considered the major difference between the two programs. It seems reasonable to conclude that the PPA provided the impetus for improving field reliability.

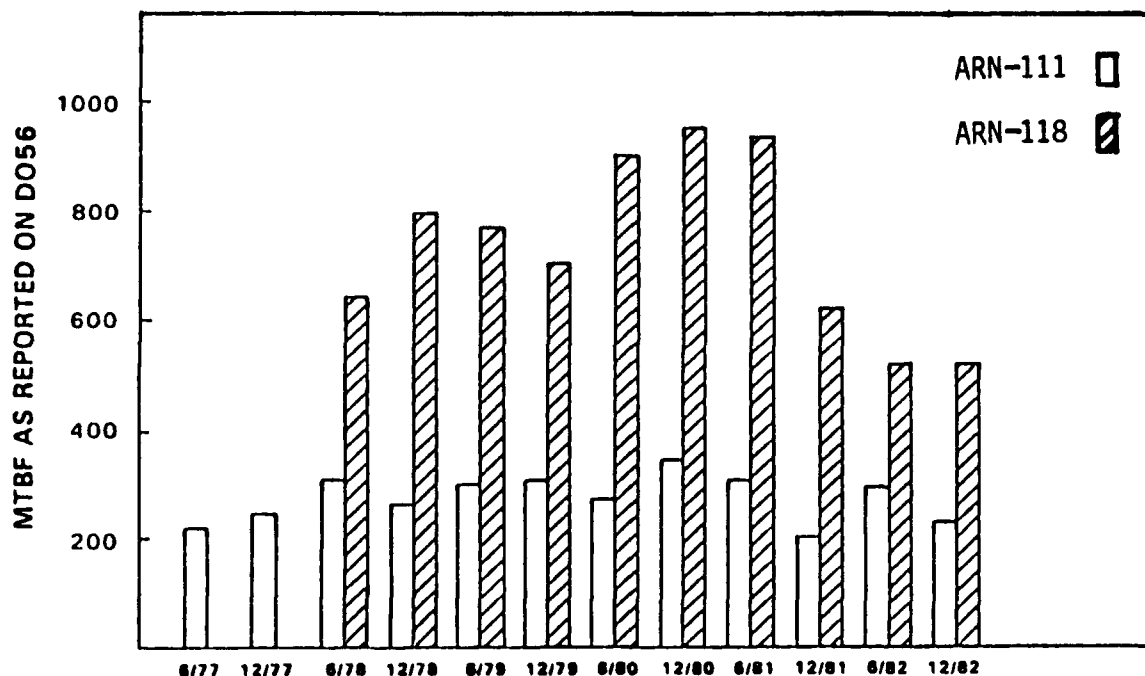


Figure 3-3 Improved Reliability: F-15 TACANs

3.3.2 MTBF Improvement/Lower Net LCC

The prospect of reducing LCC is a major reason for using PPAs. The Carousel Inertial Navigation System (INS) program is another example of the positive impact on LCC of an improved MTBF. The program included a four year RIW with an MTBF Guarantee. The Carousel was basically an "off the shelf" INS which had been used by the commercial airlines with an MTBF in the 750 hour range. While the contractor promised the Air Force an INS with a fielded MTBF of 1,128 hours -- 1,313 hours were actually achieved. Figure 1-3 shows the impact on spares cost of the realized field MTBF.

- The performance improvement between the contracted and the realized values produces a \$2.0M net LCC savings.
- Comparing the realized MTBF to commercial performance indicates a \$7.0M savings.

The positive contractor response to the PPA incentive resulted in solid reliability gains at lower LCC.

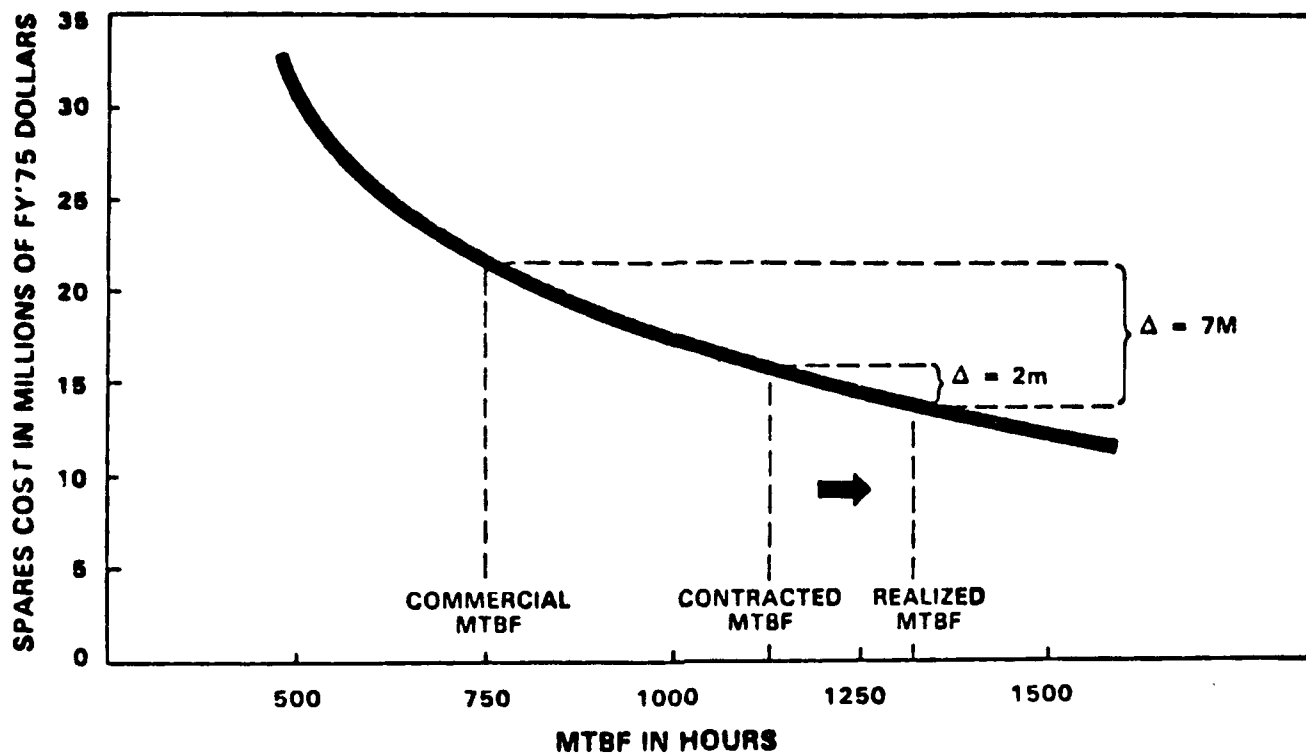


Figure 3-4 Carousel Inertial Navigation System

3.3.3 Reliability Growth

DoD programs using PPAs produce a consistent pattern of reliability growth. While the growth may not always be as substantial as predicted, they do reflect positive results. The field reliability pattern of the ARN 118 TACAN, is typical of the results which PPAs produce. Other programs experiencing similar results include:

- F-111 Gyroscope
- AN/APN-209 Altimeter
- CN-494/AJB 3 Gyroscope
- AN/ARN-194 Radar Altimeter
- T 700 Engine.

3.3.4 Improved Availability

Some PPAs require the contractor to provide consignment (loaner) spares to the Government if the guaranteed values for reliability, maintainability, or availability are not achieved. Consignment spares means that the contractor will provide additional spares (above what the Government purchased) at no

additional cost to the Government. Thus PPA provides the user a steady state of spares availability. This helps to sustain desired mission capability regardless of system/item performance.

The consignment spares requirement is considered to be a negative incentive. Positive incentives are also available within a PPA, and the two types can be effectively teamed together. The motivation to exceed specified performance levels, thereby improving the profit position, is a more significant incentive than no-cost spares or corrective actions. When this occurs the DoD benefits from improved system performance lower, LCC and increased availability.

PPAs enhance availability through improving R&M.

Enhanced availability improves mission success.

3.3.5. Return On Investment (ROI)

Table 3-1 shows the cost, savings, and ROI for some typical, pre-1985, RIW programs. In accumulating cost/savings data and determining ROI it is essential that all known or projected cost factors be thoroughly considered. Frequently the cost of government administration is not considered, and the non-monetary benefits of mission accomplishment and operational availability are difficult, if not impossible, to define. In spite of these problems the potential dollars saved or expenditures avoided can be significant.

In a more direct sense, investment and recurring O&M costs are quantifiable although the statistics are sometimes difficult to assemble. Table 3-1 probably does not reflect the cost of PPA administration, or the total LCC savings achieved. For instance, if the cost of administration for the F-14 Hydraulic Pump exceeded 18% of the PPA cost, there would be cause to question its cost effectiveness. These data, portrayed in Table 3-1, were compiled prior to the emphasis on LCC. If the true savings in O&M costs (over 50% of LCC) is 18% or more of the PPA price (for the F-14 Hydraulic Pump) it would offset the administration cost and make the PPA cost effective, even by today's standards.

TABLE 3-1
ECONOMIC ADVANTAGES POSSIBLE THROUGH WARRANTY INCENTIVES

RETURN ON INVESTMENT			
PROGRAM	PPA COST	PPA SAVINGS	ROI
F-14 Hydraulic Pump	\$ 1.600M	\$ 1.900M	118%
F-15 TACAN	.450M	2.500M	500%
F-16 Avionics	43.200M	118.000M	273%
Navy Gyroscope	.100M	.900M	900%
Carousel INS	4.100M	7.000M	170%

4.

PPA SELECTION, ANALYSIS, AND STRUCTURE

Creating a Product Performance Agreement (PPA) that is suited to program requirements and objectives can be divided into four steps.

- Choosing the general program parameters (requirements, characteristics, and objectives) to be warranted. A list of parameters can be derived from Figure 4-1, or be predetermined by the acquisition team.
- Identifying alternative PPAs which best suit the program parameters. Figure 4-2, Table 4-1, and Appendix A can be used in conjunction with the program parameter list (derived from Figure 4-1) to reduce the list of available PPAs to a workable number. This may be done manually or within the PPAC Decision Support System (DSS).
- Performing an in-depth cost, benefit, and risk analysis of the alternatives. This may be done manually, or within the automated DSS.
- Developing program unique contract provisions, evaluation methods, and management techniques for the selected alternative(s).

NOTE

The following paragraphs are an attempt to discuss an extremely complex subject in simple terms. Most of the math involved is dealt with in a static mode, while the true computations will be dynamic. A detailed tutorial of the PPA decision process is contained within the automated DSS.

While the DSS Tutorial may be faster, and more useful to an experienced cost analyst or engineer, this discussion is intended to put the reader "into the ball park" from the conceptual point of view.

It may be helpful for the "first-timer" to read all of the paragraphs, look at the figures and tables, and reread the paragraphs. The figures and tables have been placed at the rear of this section to facilitate their use as a decision aid.

4.1. CHOOSING THE PARAMETERS

Good business sense often guides the acquisition team towards guaranteeing many facets of their program and PPAs have been developed to cover anything that can be quantified or stated, measured, and compared numerically. To begin the selection process, the basic agreement parameters are listed, quantified, and matched with a relevant PPA or group of PPAs. To better illustrate the typical requirements, Figure 4-1 shows a worksheet for choosing program parameters. The relevant parameters for a specific application should be listed similar to the output section of the figure for use in paragraph 4.2.

4.2. SELECTION OF ALTERNATIVE PPAS

Cross reference the program and equipment characteristics listed from paragraph 4.1. against PPA alternatives (see Appendix A) to narrow the list. Use program parameters and PPA characteristics to eliminate PPAs which do not apply to a particular program or to a specific type of equipment. Depending upon the program or PPA requirements and the level of system/item technology; the acquisition team may choose, or have their choices limited to, a simple or comprehensive PPA.

"Simple" and "Comprehensive" PPAs are extremes on either end of a comparability line. Simple PPAs have no provisions to direct or motivate contractors to consider convenient government warranty administration and management. Commercial warranties which expect the customer to return the merchandise to the vendor for warranty service are simple clauses. Comprehensive PPAs, along with additional performance requirements and/or stricter specification enforcement, include provisions that make the warranty more manageable and administrable by the Government. If the Air Force expects to use the item to generate or accomplish military missions, both the entity and the PPA must be compatible with the user's intended operational and maintenance environments.

4.2.1. The Variety Of Potential Applications

There is a wide variety of potential PPA applications with some degree of overlap between them. Figures 4-2 and 4-3 are PPA decision aids. They illustrate the relationships between different program parameters and the PPA concepts designed to guarantee their success. In Table 4-1 the concept groups are further expanded. In Appendix A the PPA descriptions are listed by their application according to a different concept grouping. You may derive your own concept grouping if the parameters of your program, or your PPA requirements, make it easier to do so.

4.2.2. Application Overlap

Some overlap continues even after the segregation into PPA

concept groups. It is possible to use one simple provision to accomplish two or more objectives, and to require two or more comprehensive provisions to accomplish a single objective. If your program parameters suggest multiple PPA objectives, the list obtained from matching the output block from figure 4-1 to the PPA catalog may identify PPAs from different concept groups. To account for major differences in equipment characteristics the selection process should be performed separately for different systems, components, or objectives in the program. This may require several iterations as parameters and program priorities are refined.

4.3. PERFORMING THE IN-DEPTH ANALYSIS;

4.3.1. PPA Alternatives

The output from paragraphs 4.1. and 4.2. is a list of PPA alternatives. The PPA specifies the cost areas, incentive method, remedies/compensations, relevant performance parameters, and areas of benefit. The program specifies the framework for PPA operation, including logistics structure, operational characteristics, equipment characteristics, available data, and program life cycle. PPA analysis should address, and may have to be reaccomplished due to changes in:

- 0 Unknown fundamental parameters
(i.e., Mean-Time-Between-Failure or MTBF),
- 0 System operating variations,
- 0 Performance estimation through testing or sampling,
- 0 Changes in system design, or
- 0 Changes in maintenance concepts.

These uncertainties have a sizable effect on the PPA's actual costs and benefits to the Government. It is important to continually assess their impact on the program. Previous programs should also be studied to take advantage of lessons learned. When a preliminary best approach is decided upon, a Cost Benefit Analysis (CBA) should be performed.

4.3.2. The Cost Benefit Analysis

The CBA analyses depend upon the PPA alternatives and the program under consideration. Some of the analyses include:

- 4.3.2.1. Estimation of Government PPA costs,
- 4.3.2.2. Government risk analysis,
- 4.3.2.3. Estimation of contractor PPA cost,
- 4.3.2.4. Contractor risk analysis,
- 4.3.2.5. Life cycle cost (LCC) savings prediction,
- 4.3.2.6. Penalty calculation,

4.3.2.7. Cost variance calculation,

4.3.2.8. Probability of error in the method of evaluation,

The mathematic expressions outlined below describe the types of calculations required, and are presented mainly for discussion purposes. For instance; "delta life cycle cost" is an expression of convenience for performing two LCC analyses, one with and one without a given warranty, and taking their algebraic sum. The actual equations for computing the CBA are in Table 4-2, and in the PPA Decision Support Handbook. This document is available from the PPAC.

$$TDS = [\Delta LCC - (TC_g + TC_c)]$$

Where TDS = The total dollars saved

ΔLCC = the difference in LCC between buying the system with and without a given PPA,

TC_g = the sum of the government PPA costs, and

TC_c = the sum of the contractor PPA costs (PPA price).

4.3.2.1. Government PPA costs are,

$$TC_g = [(\Delta R_d \times L_a) \times R'] + (E_n \times E_{cg}) + [G \times (W_f \times L_s)]$$

and are the sum of event related and time related costs.

Event related costs are:

ΔR_d ; the difference in paperwork time between warranty returns and normal repairs and/or condemnation/not reparable this station (NRTS) actions,

Times L_a ; the average labor rate at each operational or repair location,

Times R' ; the number of expected warranty repair actions.

Plus E_n ; the estimated number of no-cost engineering change proposals (ECPs).

Times E_{cg} ; the mean estimated Government ECP cost.

Time related costs are:

G ; The number of government personnel required to monitor the warranty,

Times W_f ; the mean fraction of their total workload this warranty will become,

Times L_s ; the labor rate for a person of their rank /position.

4.3.2.2. A probability of the Government risk is applied to the estimated Government costs to establish the best and worst cases for both system and warranty performance.

4.3.2.3. Contractor PPA costs are,

$TC_c = [R' \times (C_s + C_r + C_h + F_a)] + (E_n \times E_{cc}) + [I \times (W_f' \times L_s')]$
and are also the sum of event related and time related costs.

Event related costs are :

R' ; The number of predicted repair actions,
Times $(C_s + C_r + C_h + F_a)$; the mean shipping, maintenance,
storage, and failure analysis costs;
Plus E_n ; the estimated number of no-cost ECPs
Times E_{cc} ; the mean estimated contractor ECP cost.

Time related costs are:

I ; The number of contractor personnel required to
monitor the warranty;
Times W_f' ; the mean fraction of their total workload this
warranty will become,
Times L_s' ; the labor rate for a person of their rank/
position.

4.3.2.4. A probability of the contractor risk is also applied to the estimated contractor costs to establish the upper and lower bounds of the PPA price estimate.

4.3.2.5. The difference in LCC estimates with and without the the PPA is the predicted Government LCC savings.

NOTE

If the intended output is not to justify a waiver request, and this comparison is negative, return to the beginning and reassess the program parameters.

4.3.2.6. If a negative incentive is planned a penalty calculation should be conducted, based on the Government and contractor risks and the system technology being developed.

4.3.2.7. Upper and lower bounds are adjusted on the estimates by performing cost variance predictions on both the contractor and Government costs.

4.3.2.8. Further refinements are made by sensitivity analysis on the probability of errors in the method of evaluation, for both system and PPA performance. Sensitivity analyses are performed by running the calculations with the mean error, the upper boundary error and the lower boundary error. This tells the acquisition team the magnitude and direction of change in cost and benefits that will occur with a given error in a given calculation.

NOTE

Errors may drive the cost and/or benefits in an unacceptable direction, and/or at an unacceptable rate. When this happens, return to the beginning, and reassess the parameters and objectives.

4.3.3. The Decision Support System

For consistency and speed, computer models should be used for calculations of this type and depth. The automated DSS contains models used for PPA CBA. The DSS process is fully explained in the PPA Decision Support Handbook.

4.3.4. Example

The steps for testing the Reliability Improvement Warranty (RIW) make a good example of the analytical process. The RIW is one of the most comprehensive PPAs, so the steps may be tailored or omitted for evaluating other PPAs:

- Estimate reliability growth over the RIW period. Use the best available data at the time and make several estimations. Establish the maximum and minimum bounds of the growth parameter and calculate the corresponding schedules for them.
- Estimate the contractor cost. Allow for a range of profit and risk factors to give a corresponding range for the RIW price.
- Calculate the LCC with and without the RIW to approximate the LCC savings. To assess the benefits of different reliability growth scenarios, use the range of reliability growth schedules calculated previously.

To assess the variance in LCC and performance, perform sensitivity analyses on:

- Length of the PPA period;
- Utilization rate;
- System activation schedules;
- Turnaround time; and
- Range of performance parameter values.

Reliability growth schedules must be recalculated to account for the change in average operating hours if there is a change in the utilization rate, or in the system activation schedule.

Outputs of particular interest include:

- 0 Total Cost Summary;
- 0 Spares Requirements;
- 0 Manpower Requirements; and
- 0 Corrective Maintenance Summary.

Approximate the consignment spares costs for a range of achieved MTBFs which are less than the MTBF predictions.

Approximate the consignment spares costs for a range of turnaround time (TAT) levels which are greater than the estimated TAT.

4.3.5. Final PPA Selection

After examining general PPA options and analyzing their impact on the program; the acquisition team can rank alternatives, choose between them, and tailor the chosen PPA to meet the specific requirements and objectives of the program.

4.4. STRUCTURING THE PPA

Writing the PPA provision includes:

- 0 Choosing the final performance requirements;
- 0 Determining the duration of the PPA;
- 0 Defining the test/evaluation criteria procedures, sample size, and method;
- 0 Defining the remedies/incentives; and
- 0 Identifying data collection requirements, procedures, and tracking mechanisms as may be required.

APPENDIX B contains a number of sample (Generic) PPA contract provisions. These may be used as is, tailored, expanded, or as a basis for ideas. The PPAC is also available to assist the acquisition team in drafting a particular provision for a particular situation.

4.5. ADDITIONAL USES

The PPA analysis results should be retained to support proposal evaluation/contract negotiations. The estimates of PPA price, cost, and benefits are ready points of comparison between contractor proposals and the statement of work. The sensitivity analyses help in adjusting cost or risk factors if parameter values behave differently than expected during the program life.

System Type

Aircraft,
Aircraft Subsystem,
Groundborne Communication system,
Communication subsystem,
Support equipment,
Technical Data,
Test/Support system/method,
Software.

Technology Level

Initial introduction to the inventory,
Commercial adaptation,
Second or subsequent iteration,
Hybrid mix of new and familiar.

Operational Concept

Performance requirements,
Method of Employment,
Hours/Cycles/Life units of operation,
Hours/etc. for mission task,
Total operating hours/etc,
Probable operational locations,
Probable operational climate(s).

Maintenance Concept

Mean turn-around time for
preventive maintenance,
Mean turn-around time for
corrective maintenance,
Anticipated levels of maintenance,
Mean-time-between-failure for each level,
Support systems at each level,
Logistics trail length for each level,
Probability of battle damage.

FIGURE 4-1
AGREEMENT PARAMETERS WORKSHEET

PPA Requirements

(10 USC 2403) Performance,
Manufacturing and Design,
Materials and Workmanship,
Reliability,
Maintainability,
Availability,
Logistics Support Cost,
Technical Data/Orders,
System Compatibility with
existing Test/Operational
Methods/Equipment,

Output Parameter List

System _____

Technology _____

Operational Concept _____

Maintenance Concept _____

PPA
Requirements _____

Comments _____

FIGURE 4-1
AGREEMENT PARAMETERS WORKSHEET
(continued)

**PPA Type vs. Technology Level
with Risk/Cost Target as the field**

<u>TECHNOLOGY LEVEL</u>				
<u>AVAILABLE PPAs</u>	NEW R&D	NEW AND MATURE MIX	MATURE	DEPOT REBUY
PERFORMANCE INCENTIVES	LOW	EFFECTIVE ADDITION	EFFECTIVE ADDITION	EFFECTIVE ADDITION
WARRANTY OF SYSTEMS AND EQUIPMENT IAW 10 U.S.C. 2403	MEDIUM	LOW	LOW	LOW
EXPANDED WARRANTY AND EQUIPMENT IAW 10 U.S.C. 2403	MEDIUM	MEDIUM LOW	MEDIUM LOW	LOW
COMPREHENSIVE PERFORMANCE AND CORRECTION OF DEFICIENCIES CLAUSES	HIGH	HIGH MEDIUM	MEDIUM	MEDIUM
SPECIAL FEATURES	OPTION	OPTION	OPTION	OPTION
<u>RISK/COST TARGET FIELD</u>				

Figure 4-2

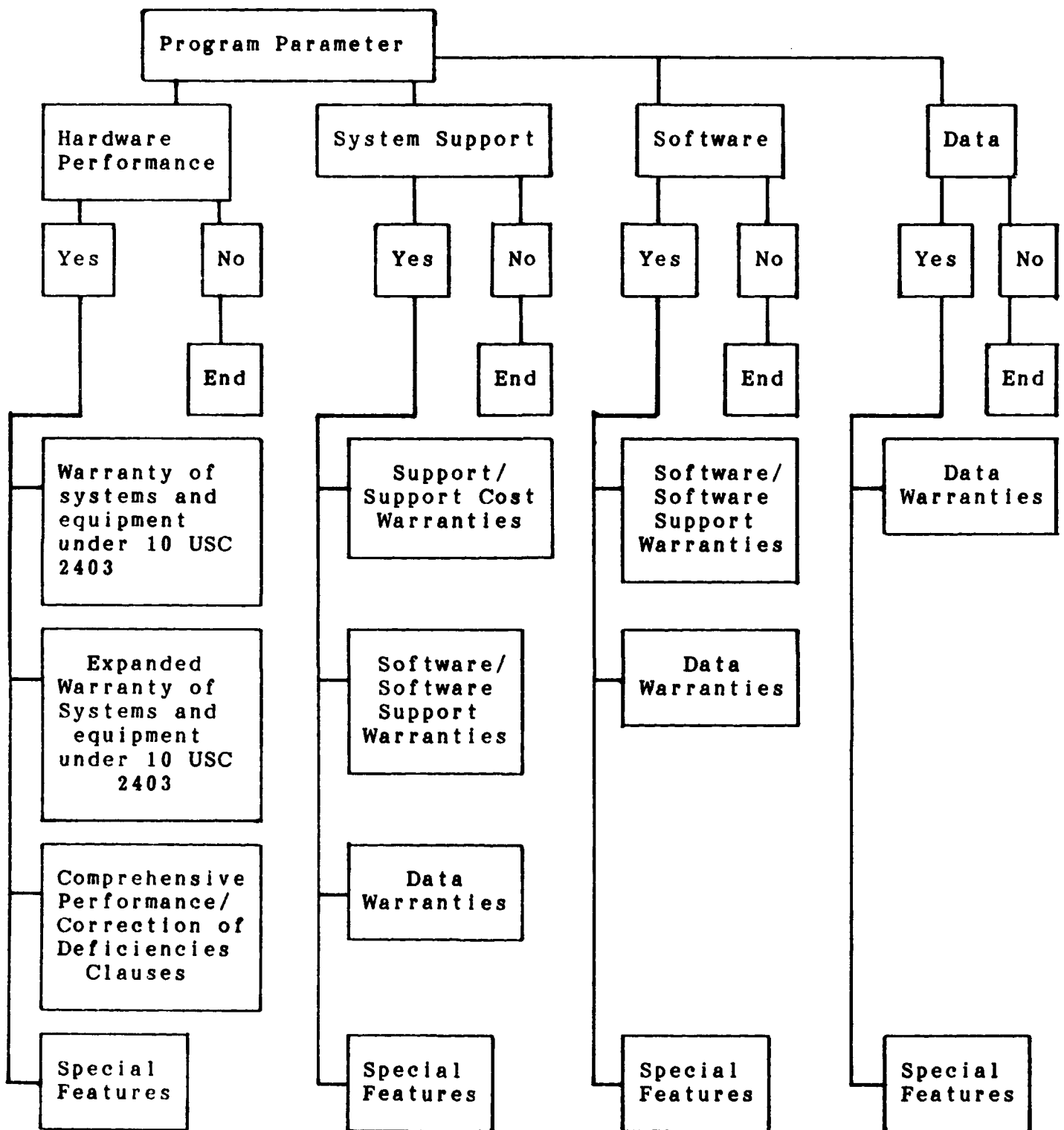


FIGURE 4-3
PPA Decision Tree

TABLE 4-1
PPAs BY CONCEPT GROUP

////////////////////
WARRANTY OF SYSTEMS AND EQUIPMENT
UNDER 10 USC 2403

- o Essential Performance Requirements Guarantee
- o Design and Manufacturing Requirements Guarantee
- o Materials and Workmanship Guarantee

EXPANDED WARRANTY OF SYSTEMS AND
EQUIPMENT UNDER 10 USC 2403

- o Rewarranty of Repaired/Overhauled Equipment
- o Repair/Exchange Agreements
- o Reliability Warranty
- o Maintainability Warranty
- o Reliability and Maintainability (R&M) Warranty
- o Availability Warranty
- o Component Reliability Warranty
- o Model Engine Warranty

COMPREHENSIVE PERFORMANCE/
CORRECTION OF DEFICIENCIES CLAUSES

- o Model Engine Warranty
- o Reliability Improvement Warranty (RIW)
- o Mean-Time-Between-Failure Guarantee with Verification
Test (MTBF VT)
- o RIW with MTBF VT
- o Reliability and Maintainability Improvement Warranty
(R&MIW)
- o R&MIW with MTBF VT
- o Availability Guarantee
- o Chronic LRU Guarantee
- o Spare Parts Level Warranty
- o Logistics support Cost Guarantee
- o Maximum Parts Cost Guarantee

TABLE 4-1 (cont.)
PPAs BY CONCEPT GROUP

SUPPORT/SUPPORT COST
WARRANTIES

- o Spare Parts Level Warranty
- o Logistics Support Cost Guarantee
- o Maximum Parts Cost Guarantee
- o Method of Test Guarantee
- o Test and Repair Improvement Guarantee
- o Fault Detection, Isolation, and Repair Warranty
- o Quality of Training Materials Warranty

SOFTWARE/SOFTWARE SUPPORT
WARRANTIES

- o Software Design Commitment Guarantee
- o LRU Software Configuration Control and Support Agreement
- o Fault Detection, Isolation, and Repair Warranty
- o Test and Repair Improvement Guarantee
- o Method of Test Guarantee
- o Utility Functions Guarantee
- o Warranty of Technical Data
- o Warranty of Technical Orders

TABLE 4-1 (cont.)
PPAs BY CONCEPT GROUP

SPECIAL FEATURES
WARRANTIES

- o Rewarranty of Repaired/Overhauled Equipment
- o Repair/Exchange Agreements
- o Chronic LRU Warranty
- o Spare Parts Level Warranty
- o Maximum Parts Cost Guarantee
- o Ultimate Life Guarantee
- o Commercial Service Life Guarantee
- o LRU Software Configuration Control and Support Agreement
- o Fault Detection, Isolation, and Repair Warranty
- o Method of Test Guarantee
- o Test and Repair Improvement Guarantee
- o Quality of Training Materials Warranty
- o Warranty of Technical Data
- o Warranty of Technical Orders

////////////////////////////////////

TABLE 4-2
COST BENEFIT ANALYSIS EQUATIONS
CROSS REFERENCE LIST

1. TDS represents the total dollars saved, and is;

$$[\Delta LCC - (TC_g + TC_c)]$$
-
2. LCC represents the savings in life cycle cost between the item with and without the warranty, and is;

$$\sum_{i=1}^N C_i \text{ (without a warranty) minus } \sum_{i=1}^N C_i \text{ (with a warranty)}$$

where C = the cost over one year,
 i = an integer representing each year in the cost stream, and
 N = the total number of years in the cost stream.

(Equation 4.1-1 from the PPA Decision Support Handbook)

3. TC represents the total Government cost for the warranty and warranty administration and management. It is;

$$[(\Delta R_d \times L_a) \times R'] + (E_n \times E_{cg}) + [(G \times W_f) \times L_s]$$

4. ΔR_d represents the difference in repair paperwork processing between warranty returns and normal maintenance actions (under a three level maintenance concept). It is derived from sensitivity analysis on;

$$\left[\begin{array}{l} \text{Average labor required} \\ \text{for in-place system} \\ \text{repair (manhours)} \end{array} \times \begin{array}{l} \text{Standard base} \\ \text{labor rate} \\ \text{(\$/man hr)} \end{array} \times \begin{array}{l} \text{Average material} \\ \text{cost per} \\ \text{in-place repair} \end{array} \right]$$

$$\times \frac{1}{\text{MTBF}} \times \begin{array}{l} \text{Cumulative} \\ \text{\# systems} \end{array} \times \begin{array}{l} \text{Quantity} \\ \text{per} \\ \text{assembly} \end{array} \times \begin{array}{l} \text{Operating} \\ \text{hours} \end{array} \times$$

$$\begin{array}{l} \text{Expected fraction} \\ \text{of system failures} \\ \text{repaired in-place} \end{array} + \left[\sum \text{LRUs} \left(\begin{array}{l} \text{Expected No} \\ \text{of removals} \\ \text{per year} \end{array} \times \begin{array}{l} \text{No of man hrs to} \\ \text{fault isolate and} \\ \text{remove/repl LRU} \end{array} \right) \right]$$

$$\left. \begin{array}{l} \text{Standard base} \\ \text{labor rate} \end{array} \right) \left. \right] + \left[\sum \text{LRUs} \left(\begin{array}{l} \text{expected no} \\ \text{of removals} \\ \text{per year} \end{array} \times \begin{array}{l} \text{Mean time to} \\ \text{repair LRU} \end{array} \times \right. \right]$$

$$\left. \begin{array}{l} \text{Standard base} \\ \text{labor rate} \end{array} + \begin{array}{l} \text{Base level} \\ \text{material} \\ \text{consumption rate} \end{array} \right)$$

(Equation 4.1.21 From the PPA Decision Support Handbook)

5. L_a represents the labor rate for each local area of warranty administration, and is available from Air Force Sources. If more than one area, or more than one level of maintenance will be used the equations using L_a have to be computed for each rate and summed.

6. E represents the estimated number of engineering change proposals required during the warranty period. It is a risk related probability based upon the complexity of the system and the historical behavior of similar equipment and technology.

7. E_{G} represents the estimated mean Government ECP cost, or how much it costs the Government to implement and administer the Time Compliance Technical Orders (TCTOs).

8. R' represents the expected number of warranty repairs derived using the expected MTBF from program estimates, and operational use information from the customer.

9. G represents the number of government personnel required to monitor the warranty. It represents both wage earning and salaried personnel. It is derived from the amount of data the warranty generates, the amount of that data that can be extracted from existing data systems, and the number and type of reports which must be generated at all levels.

10. W_f represents the workload fraction that monitoring the warranty will become, for personnel involved with the warranty. It is derived from the number of administrative actions required to monitor the warranty, how long it takes to accomplish each task, and the projected task breakdown in the monitoring office.

11. L_s represents the labor rate for individual personnel involved with monitoring the warranty. It represents both wage earning and salaried personnel, and is available from AF Sources. If more than one rate is involved the equations using L_s must be computed for each rate and summed.

12. TC represents the total contractor cost of the warranty (Warranty Price to the Government), and is;

$$[R' \times (C_s + C_r + C_h + F_a)] + (E_n \times E_{cc}) + [I \times (W_f \times L_s)]$$

13. R' is the same as explained in #8. above.

14. C_s represents the contractor's shipping costs for the expected number of warranty repairs, and is;

$$\begin{aligned} & (\text{Weight}) \times \left[\left(\frac{\# \text{ of systems CONUS}}{\text{Total \# of systems}} \times \text{CONUS Shipping rate (\$/lb.)} \right) \right. \\ & \left. + \left(\frac{\# \text{ of systems overseas}}{\text{Total \# of systems}} \times \text{Shipping cost OVERSEAS (\$/lb.)} \right) \right] \end{aligned}$$

(Equation 4.1-23 From the PPA Decision Support Handbook)

15. C_r represents the contractor's repair costs for the expected number of warranty repairs, and is computed from equation 4.1.21 or 22 (two level maintenance) in the PPA Decision Support Handbook. (See ΔR_d #4. Above)

16. C_h represents the contractor's handling and storage costs for the expected number of warranty repairs, and is;

$$\left(\begin{array}{c} \text{AREA} \\ \text{Spares} \\ \text{Storage} \\ \text{costs} \end{array} \right) \cdot \sum_{i=1}^{\# \text{ of items}} \cdot \sum_{m=1}^{\# \text{ of Bases}} \cdot \sum_{\text{base m}}^{\# \text{ of item i at}} \cdot \left(\begin{array}{c} \text{Weight} \\ \text{of} \\ \text{item i} \end{array} \right)$$

(Equation 4.1-30,31,32 From the PPA Decision Support Handbook)

17. F_a represents the failure analysis costs to the contractor and can be estimated by using the failure analysis costs to the AF Technology Repair Center for similar items and technology.

18. E_n represents the estimated number of engineering change proposals required during the warranty period. It is the same as #6 above.

19. E_{cc} represents the estimated mean contractor ECP cost

(part of the warranty price to the Government). It is computed using;

A finite fraction of the original design cost, corresponding to the amount of redesign required.

A factor corresponding to the number of ECPs generated (which is related to the perceived risk of the original design),

A finite fraction of the original cost for data corresponding to the amount of data generated,

An overhead charge corresponding to the level of effort,

A cost of retrofit related to the number of retrofits required, the cost of materials for one retrofit, and the level of effort required to retrofit,

A delta materials charge (+ or -) related to the difference in parts cost between the old design and the new design times the number of items still to be produced.

$$\begin{aligned} E_{cc} = & \left(\begin{array}{l} \text{the original} \\ \text{design cost} \end{array} \times \begin{array}{l} \text{the finite} \\ \text{ECP fraction} \end{array} \times \begin{array}{l} \text{the design} \\ \text{risk factor} \end{array} \right) \\ & + \left(\begin{array}{l} \text{the original} \\ \text{data cost} \end{array} \times \begin{array}{l} \text{the data} \\ \text{fraction} \end{array} \right) + \begin{array}{l} \text{the overhead} \\ \text{charge} \end{array} + \\ & \left[\left(\begin{array}{l} \text{the retrofit} \\ \text{materials cost} \end{array} + \begin{array}{l} \text{the retrofit} \\ \text{labor cost} \end{array} \right) \times \begin{array}{l} \text{the number} \\ \text{of retrofits} \end{array} \right] + \\ & \left(\begin{array}{l} \text{the delta} \\ \text{materials charge} \end{array} \times \begin{array}{l} \text{the number of items} \\ \text{to be produced} \end{array} \right) \end{aligned}$$

20.

I represents the number of Industry personnel required to monitor the warranty, and is computed the same as G in #8. above.

21.

W_f' represents the workload fraction that monitoring the warranty will become, for contractor personnel involved with the warranty. It is computed the same as W_f in #9. above.

22.

L_g' represents the labor rate for individual contractor personnel involved with monitoring the warranty. It represents both wage earning and salaried personnel, and is available from businesses dealing with the Government.

5.1. APPLICATION MANAGEMENT

Application management relates to the requirements to be warranted, when to apply the Product Performance Agreement (PPA), which PPA to apply, and interfacing with the eventual PPA administrators. The technical aspects of choosing parameters, and to a great extent which PPA to apply, were discussed in Section 4. This Section concentrates on the non-technical aspects of PPAs.

5.1.1. Timing the PPA Application;

When contractors are expected to bear more of the burden of product performance, they should be afforded an opportunity to influence product design, so long as the overall performance and support objectives are satisfied. This means that the Government must announce the intent to pursue a PPA as early as possible in the acquisition cycle. Figure 4-1 illustrates the Mean Time Between Failure (MTBF) growth of a program versus the timing of the PPA application.

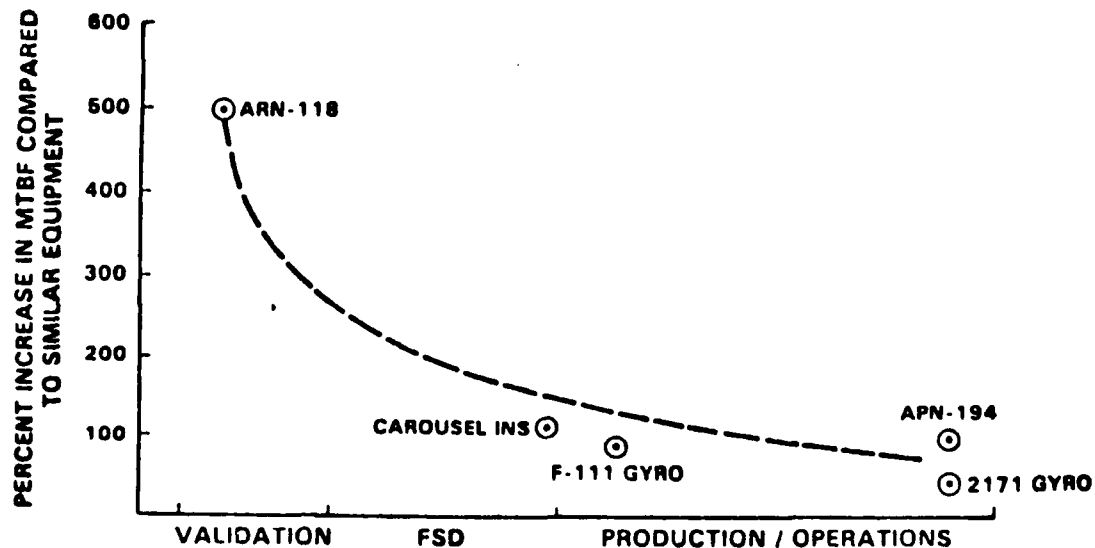


Figure 5-1 MTBF vs. PPA Timing

PPA requirements begin in the System Operational Concept (SOC), Statement of Operational Need (SON) or the Program Management Directive (PMD), whichever comes first. The many types of provisions (See APPENDIX A) and the freedom to interpret and combine provisions make it possible to guarantee virtually any quantifiable/measurable requirement in the SOC, SON, or PMD.

Specific PPA coverage can be addressed as another operational requirement. If they have a specific concern, objective, or PPA in mind, the requesting MAJCOM must make their requirements known early in the acquisition cycle. Quantification of performance or support requirements can occur at any point in the pre-production phases of development. As soon as a user requirement is quantified, or baselined, a PPA on the associated production deliverable(s) should be considered.

5.1.2. PPAs and the Request for Proposal/Purchase Description

The Department of Defense Federal Acquisition Regulation Supplement (DFARS) section 46.7 expanded 10 USC 2403 to include major subsystems in the definition of weapon system. The specific PPA chosen will depend upon specific program parameters. (like those listed in Figure 4-1) It will also depend upon type of procurement and the level of technology being proposed.

5.1.2.1. Type of Procurement:

The type, style and depth of a PPA may be decided by the type of procurement. For example, a new technology Research and Development (R&D) project should not require a performance guarantee. The risk, which equates to cost, is generally high enough that a PPA would not be effective. During the conceptual phase the best approach would be an incentive provision. 10 USC 2403 and the DFARS were written with this in mind. In a production contract for the second or subsequent generation of a given technology is the best time for comprehensive PPAs like the RIW, MTBF Guarantee, or Model Engine Warranty. When contractors have some experience with the technology is the best time to hold them responsible for the finer points of their efforts. Reprocurement is also a viable time for the comprehensive PPAs, particularly if the system/equipment:

- Is designated as an Air Force Standard.
- Has a history of reliability or supportability problems.
- Suggests the capability/requirement to accept newer technology than currently utilized.

Using a comprehensive PPA during reprocurement allows the AF to benefit from reliability growth throughout the balance of the system's life cycle.

5.1.2.2. Level of Technology:

Contractors cannot support new technologies and accept comprehensive PPAs without extensive cost considerations. This dilemma can be tempered, however, by an extended user testing period. After which a Reliability Improvement Warranty and/or a Mean-Time-Between-Failure Verification Test provision would provide extended contractor liability with greater configuration flexibility. This would allow the contractor to improve the item's reliability, while allowing the USAF more personnel train-

ing time. This cooperative procurement method should mature the technology faster and provide better insight into effective system maintenance concepts. Comprehensive PPAs are more easily applied to older technology systems with established reliability trends and proven maintenance concepts. The object here is to apply lessons learned such that the technology, reliability, and maintainability grow together as rapidly as practical. We can expect more contractor commitment for an item they have experience with. Through a PPA we can monetarily encourage them to continue improving their product. Careful attention must be paid to efforts which involve HYBRID technology. That cross between new and old technology appears in almost every system procurement. RFPs should allow contractor flexibility in technology application, while stressing the requirement for an overall available, reliable, and maintainable system. Proposals should be carefully evaluated for their technical merit, and the comprehensiveness of the proposed PPA. The contractor's willingness to mix new technology and a comprehensive PPA is a measure of their confidence in the technology, its application, and ultimate production. The decision matrix for PPA application vs. technology level is reflected in Figure 4-2.

5.2. PPA ADMINISTRATION MANAGEMENT

The PPA is generally understood to be a contractor incentive. Government agencies must also be motivated to insure effective PPA management. For instance:

- The using MAJCOM should be motivated to honor the PPA. (PPA provisions should not hamper the operational mission of the Command.)
- Maintenance and supply personnel must be motivated to perform their administrative tasks properly, and quickly.
- The supporting Air Logistics Centers (ALCs) should be motivated to support the PPA.
- Feedback must be given to the using MAJCOMs and their field activities concerning system and PPA performance.

The PPA, and its implementation plan (PIP), are the source of these motivations. The PIP should also address feedback from the PPA managers to the personnel performing the management and administration tasks.

The PPA sets forth certain obligations for both the contractor and the Government. It also sets forth the expected methods of compliance with the obligations, and redress of problems or conflicts. A well written and properly applied PPA should have clear expectations, viable methods of compliance, and credible methods of redress.

5.2.1 Basic Contractor Obligation

- 0 Prompt correction of deficiencies in their product whenever it fails to perform IAW the contracted specification and/or changes thereto; or
- 0 Reimburse the Government for obtaining correction of such deficiencies elsewhere.

5.2.2 Additional Contractor Obligations

For some PPAs additional contractor obligations are;

- 0 Reliability and/or maintainability growth.
- 0 No-Cost (to the Government) Engineering Change Proposals (ECPs).
 - Production change
 - Retrofit
 - Technical Data
 - Software
 - Support Equipment
 - Spares
- 0 Bonded spares storage, (to support mission systems with contractor maintenance)
- 0 Reimbursement for Government repairs made to end items in the field. (when contractually allowed or required)

5.2.3 Government Obligations:

The overall obligations of the Government are

- 0 Keeping accurate records;
- 0 Failure notification; and
- 0 Monitoring contractor PPA performance.

Obligations of the field activities are

- 0 Keeping accurate records (performance, maintenance, and configuration) in the depth required by the contract;
- 0 Failure notification;
- 0 Performing modifications when and as required by an approved Time Compliance Technical Order.(TCTO)

- 0 Managing contract exceptions; for instance
 - promoting awareness of the exception clauses,
 - tracking exception occurrences, and
 - minimizing exceptions to the extent possible under the deployment and maintenance concepts,
- 0 Disposition of assets IAW the PIP and the PPA manager's instructions.

5.3. EXAMPLE

This example is based upon typical requirements and a typical system. The system is:

- 0 An avionics subsystem purchased to upgrade a fielded weapon system capability;
- 0 Developed with a mixture of state-of-the-art and proven technology;
- 0 Deployed into an existing three level maintenance concept where the mission and system criticality, and the forecast system MTBF precluded a conversion to two level.
- 0 Overseas aircraft basing drove the cost of a full RIW too high.
- 0 The planned mean operational use (including maintenance "on time") is for:
 - 6 hours per flight;
 - 2 flights per day;
 - 3 days per week;
 - 2 weeks per month;
 - 11 months per year;
 - totalling 792 hours "on time" per year.

The selected PPA is:

- 0 A Component Reliability and Line Replaceable Unit (LRU) Maintainability Warranty.
- 0 The PPA clause guarantees subsystem performance for a specific calendar time.
- 0 SRU (component) reliability is measured by "mean SRU MTBF", which is:

[LRU ETI out - LRU ETI in] x [the # of SRUs installed]
 (including the Chassis and/or "Mother Board")

- 0 The target "mean SRU MTBF" is 2000 hours.
- 0 The warranty duration of 30 months (2.5 years, or 2000 hours divided by 800 "on" hours per year) is designed to minimize the billing of warranty repairs under the Interim Contractor Support (ICS) contract.
- 0 A failure is defined as the LRU requiring maintenance attention for any reason; except for changing filters or dessicant compounds, required periodic lubrication, or other actions noted in the exceptions clause.
- 0 The contractor is responsible for repair/replacement of Shop Replaceable Units (SRUs), including shipping costs to and from the contractor repair facility and the point of Government acceptance.
- 0 The owning organization is responsible for Organizational (O) level (on equipment) maintenance. (on the subsystem itself) and Intermediate (I) level (off equipment) maintenance. (on the LRUs)
- 0 The LRU maintainability provision states that any SRU can be removed and replaced in less than 10 minutes;
 - Starting with the LRU covers installed and the LRU otherwise being ready to install in an aircraft,
 - Performing the SRU removal and replacement (R&R),
 - Ending with the LRU covers installed and the LRU otherwise ready to install in an aircraft, and
 - Using no more than two common tools from the using MAJCOM provided common tool list.
- 0 A further LRU maintainability requirement states that;
 - The LRU and any support or test equipment be configured for any required test procedure in less than 10 minutes by one person using no more than two common tools as above,
 - That any LRU, or test or support equipment be reconfigured to an operational status following testing by the same criteria as above, and
 - For any portable equipment to be portable by one person according to OSHA standard.
- 0 For the sake of brevity Could Not Duplicate/Retest OKs (CND/RTOKs) and other warranty problems are presumed to be worked out to everyone's satisfaction.

The PPA states specifically that:

For a period of 30 months following acceptance by the Air Force of each individual LRU; the "mean SRU MTBF", at the time of LRU failure, will be not less than 2000 hours.

During the warranty period each SRU failure will require a Warranty Failure Report (WFR) be sent to the AF and contractor warranty managers. The defective SRU will be returned to the contractor for repair/replacement. LRUs remain in the possession of the owning organization unless the defect is in the serial numbered chassis of the LRU. Any "I" level SRU maintenance costs, and the "I" level LRU maintenance costs if the SRU does not achieve 2000 operating hours, are reimbursable to U.S. Treasury under the liquidated damages clause. Removals to facilitate other maintenance (such as removing the good SRU for cannibalization) are scheduled removals.

• The AF is obligated to generate accurate and timely WFRs and to return reparable assets to the contractor for repair. This routing will be different than the normal depot repair routing.

In the event the Air Force accepts an Engineering Change Proposal (ECP) to improve the reliability/maintainability of one of the LRUs, and issues a modification TCTO for the LRU.

• The field organization is obligated to incorporate the TCTO correctly, and in a timely manner. Further, the AF is obligated to keep accurate LRU configuration records.

In spite of everyone's best efforts, warranty exceptions do occur. For instance unauthorized maintenance on an SRU in order to generate an airborne rescue mission.

• The AF must manage exceptions to the PPA clause and minimize their occurrence to the extent possible.

Regardless of the value of the mission, or the judgment of the Air Force, the warranty on the SRU that was repaired without the contractor's permission is now void.

Another exception, i.e., returning an SRU and generating a WFR on an SRU with 2022 hours "mean SRU MTBF" (against a 2000 hour warranty) occurs.

• Since the contractor is required to repair first and resolve differences later, the AF must now pay the contractor for repair of the 2022 hour SRU.

This example shows that a PPA can impact the day to day maintenance of a fielded system, and the PPA itself, if it is not applied and managed properly. The planning for success with a PPA must take place early in the program, and must consider the day to day mission requirements of an operational wing. The PIP should outline exactly how the PPA will fit into the daily maintenance and administration tasks of field personnel. Those persons involved with the PPA must understand the intent of the PPA and its value to the Air Force.

APPENDIX A.

PRODUCT PERFORMANCE AGREEMENTS

A.1. INTRODUCTION

This list shows the variety of choices available to the acquisition team. The PPA should be structured to meet specific program operation, support, and life cycle cost objectives. These agreement descriptions can be combined and/or tailored to suit program requirements and the possible adaptations are virtually limitless.

A.2. EXAMPLES

The PPA examples are indexed in Table A-1:

TABLE A-1
WARRANTY DESCRIPTIONS

<u>No.</u>	<u>Title</u>	<u>Pg.</u>
I.	Warranty of Supplies (FAR 52.246-17) for non complex equipment and (FAR 52.246-18) for complex equipment; Warranty of systems and equipment under Performance Specifications or Design Criteria (FAR 52.246-19)	A.4.
II.	Warranty of Technical Data (FAR 52.246-7001)	A.5.
III.	Warranty of Technical Orders	A.6.
IV.	Reliability Warranty	A.7.
V.	Maintainability Guarantee	A.8.
VI.	Reliability and Maintainability Warranty	A.9.
VII.	Reliability Improvement Warranty	A.10.
VIII.	Reliability and Maintainability Improvement Warranty	A.11.
IX.	Mean-Time-Between-Failure Verification Test (MTBF-VT)	A.12.
X.	Reliability Improvement Warranty with an MTBF Verification Test	A.13.

XI.	R&MIW with MTBF/VT	A.14.
XII.	Component Reliability Warranty	A.15.
XIII.	Chronic LRU Guarantee	A.17.
XIV.	Availability Guarantee	A.18.
XV.	Logistics Support Cost Guarantee	A.19.
XVI.	Maximum Parts Cost Guarantee	A.21.
XVII.	Spare Parts Level Warranty	A.22.
XVIII.	Utility Functions Guarantee	A.23.
XIX.	Ultimate Life Warranty	A.23.
XX.	Commercial Service Life Warranty	A.24.
XXI.	Software Design Commitment Guarantee	A.25.
XXII.	LRU Software Configuration Control and Support Agreement	A.26.
XXIII.	Fault Detection, Isolation, and Repair Warranty	A.27.
XXIV.	Test and Repair Improvement Guarantee	A.29.
XXV.	Method of Test Guarantee	A.30.
XXVI.	Quality of Training Warranty	A.31.
XXVII.	Rewarranty of repaired/overhauled Equipment	A.32.
XXVIII.	Repair/Exchange Agreements	A.33.

A.3. FORMAT

Each of the PPA approaches will be presented in the following format:

OBJECTIVE: Defines basic reasons/benefits of the agreement.

CHARACTERISTICS: Defines whether the agreement is "corrective" or "preventive" in nature.

APPLICABILITY: Defines equipment and contract types that the agreement is suited for.

DESCRIPTION: Defines the manner in which the agreement enhances product performance and summarizes key elements of the agreement.

MEASUREMENT: Defines the unit of measurement or criteria for determining compliance.

RESULT: Defines the benefits of the application/agreement.

ADVANTAGE: Defines positive features of suitability.

DISADVANTAGE: Defines negative features or limitations.

NOTE:

The advantages and disadvantages are principally oriented toward an Air Force view of implementation. Although not stated, in many cases there may be significant advantages or disadvantages to contractors which are inherent in the use of an agreement.

GENERAL: Defines other pertinent information.

1. WARRANTY OF SUPPLIES (FAR 52.246-17/18)
 WARRANTY OF SYSTEMS & EQUIPMENT UNDER PERFORMANCE
 SPECIFICATIONS OR DESIGN CRITERIA (FAR 52.246-19)

OBJECTIVE: Extended contractor responsibility for materials, workmanship, and specification conformance beyond acceptance of supply items by the Government.

CHARACTERISTIC: Corrective.

APPLICABILITY: Fixed-price contracts for stable design items or equipment.

DESCRIPTION: Contractor liability for the adequacy of materials, workmanship, and specification conformance is extended into initial post-acceptance field operations. The duration of coverage is negotiable between the contractor and the Air Force. Provides for contractor correction of deficiencies at no additional cost or no increase in targets, depending upon contract type. May also provide for one-for-one exchange, repair of deficient items, or retention by Government of supplies with reduction in contract price. Burden of proof rests with the Government. Although repairs or replacement is the responsibility of the contractor, unauthorized Government maintenance or prior repair could void the warranty. Transportation charges are the responsibility of the contractor.

MEASUREMENT: Begins at acceptance by the Government. Is based on inability of an item to satisfactorily perform in accordance with contract requirements. May be based on specified design and/or configuration criteria.

RESULT: Contractor corrects, replaces or provides equitable price adjustment for deficiencies discovered during the warranty period.

ADVANTAGES: Causes correction of defects discovered after acceptance at no cost or on a shared incentive basis.

DISADVANTAGES: Requires careful tracking of warranted items; may be difficult to administer where maintenance and logistics support are accomplished principally through Air Force organic means. Burden of proof rests with the Government.

II. WARRANTY OF TECHNICAL DATA (FAR 52-246-7001)

OBJECTIVE: Extend contractor responsibility for satisfactory technical data to the post-acceptance time frame.

CHARACTERISTIC: Corrective.

APPLICABILITY: Fixed-price contracts and cost reimbursement type contracts.

DESCRIPTION: Contractor warrants that delivered data conforms to contractual requirements which prevail at the time of delivery of the data. Coverage applies to all levels of technical data as specified in the contract. The basic purpose is to ensure that technical data is accurate and complete. Duration of coverage will normally extend up to three years. Notification of deficiencies to be made in writing within the warranty period. Contract Officer may direct contractor to correct or replace the data, or may elect a price or fee adjustment. Provisions may be added to make the contractor responsible for damages, generally limited to no more than 10 percent of the total contract price.

MEASUREMENT: Specified in terms of conformance to control data requirements.

RESULT: Ensures complete and correct data being furnished to the Air Force.

ADVANTAGES: Deficient data will be corrected or replaced.

DISADVANTAGES: Evaluation and determination of deficiencies may be somewhat subjective and open to dispute.

III. WARRANTY OF TECHNICAL ORDERS

OBJECTIVE: Extend contractor responsibility for satisfactory technical orders to the post-acceptance time frame.

CHARACTERISTIC: Corrective.

APPLICABILITY: Fixed-price contracts and cost reimbursement type contracts.

DESCRIPTION: Contractor warrants that delivered Technical Orders (TOs) conform to contractual requirements which prevail at the time of delivery, and to require the contractor to update technical orders when an engineering change proposal or materiel improvement program impacts the delivered TOs. Coverage applies to all levels of technical orders as specified in the contract. The basic purpose is to ensure that TOs are accurate and complete. Duration of coverage will normally extend up to three years. Notification of deficiencies to be made in writing within the warranty period. Contract Officer may direct contractor to correct or replace the data, or may elect a price or fee adjustment. Provisions may be added to make the contractor responsible for damages, generally limited to no more than 10 percent of the total contract price.

MEASUREMENT: Specified in terms of conformance to contract specification requirements.

RESULT: Ensures complete and correct technical orders being furnished to the Air Force, and that configuration changes due to other warranty compliance on the delivered equipment is reflected in changes to the TOs.

ADVANTAGES: Deficient technical orders will be corrected or replaced.

DISADVANTAGES: Evaluation and determination of deficiencies may be somewhat subjective and open to dispute.

IV. RELIABILITY WARRANTY

OBJECTIVE: Reduce failure of components during intervals between periodic overhauls.

CHARACTERISTIC: Preventive.

APPLICABILITY: Critical, potentially high failure rate components. Fixed price type contract.

DESCRIPTION: The contract contains a contractor or Air Force overhaul interval for specified components and identifies remedy required when components (on an individual or statistical basis) experience specified types of failure before the next overhaul.

MEASUREMENT: User must maintain individual time-to-failure records for the affected component. These data will be used periodically to establish contractor conformance to requirements.

RESULT: Price adjustments for failure to meet specified overhaul times; loan of spare components, accomplishment of overhaul, or repair of material; or some combination of the above.

ADVANTAGES: Motivates contractor to provide increased equipment reliability and as a consequence minimizes disruption of operations between scheduled overhauls; measurement parameters easily defined. Provides an additional opportunity to learn more about field performance of products. Provides an opportunity for increased profit.

DISADVANTAGES: Requires tracking and data collection in excess of normal requirements. Can lead to litigation particularly with regard to misuse/mistreatment of equipment. Additional contractor risks involved in sale and support of products. Must rely upon user to provide data for assessments.

GENERAL: Used by aircraft industry for components which must be periodically overhauled/tested/inspected for soundness. Long term coverage (up to five years commencing with user's first use of the product) helps stabilize support programs for user.

V. MAINTAINABILITY GUARANTEE

OBJECTIVE: Reduce the Mean Time To Repair (MTTR) during maintenance and/or overhaul.

CHARACTERISTIC: Preventive.

APPLICABILITY: Critical, potentially high MTTR end items/components. Fixed price type contract.

DESCRIPTION: The contract contains a contractor or Air Force Maximum Mean Time To Remove and Replace for the components of, and a Maximum Remove and Replace Time for any component of, the specified end item (from completed end item to completed end item). Remedies required when maximum times are exceeded by specified periods of time. Limitations on special tools or specified numbers/types of tools required for disassembly/reassembly. Remedies required when the contractor exceeds the limitations or requires special tools. A statement that all maintenance procedures be listed, and accurately defined, in the item technical orders, and that the technical orders will be followed during maintenance and the maintainability demonstration. Remedies required when technical orders impact remove and replace times. A maximum number of personnel required for each maintenance task. Remedies required when a given task exceeds the maximum personnel required. A maintainability demonstration test.

MEASUREMENT: One Time: The maintainability demonstration. Multiple Tests: User must maintain individual MTTR/crew size records for the affected end item. These data will be used periodically to establish contractor conformance to requirements.

RESULT: Price adjustments for failure to meet specified maintenance times/crew sizes, Redesign of end item or component(s), Rewrite/Change of technical orders, Additional spares when MTTR impacts supply pipeline.

ADVANTAGES: Motivates the contractor to provide increased equipment maintainability and as a consequence minimizes disruption of operations due to excessive MTTR. Measurement parameters are easily defined. Provides an additional opportunity to learn more about field maintenance of products. Provides an opportunity for increased profit.

GENERAL: Designed to insure that end items are maintainable upon delivery, and that Engineering Change Proposals (ECPs) do not impact maintainability. Designed to help stabilize support programs for the user.

VI. RELIABILITY AND MAINTAINABILITY WARRANTY

OBJECTIVE: Motivate the producer to increase equipment reliability, while reducing the Mean Corrective Maintenance Time (MCMT).

CHARACTERISTIC: Preventive.

APPLICABILITY: Critical, potentially high failure rate installed components, and other mission critical installed components. Fixed price type contract.

DESCRIPTION: The contract contains a contractor or Air Force Mean Time Between Failure guarantee or overhaul interval for specified components along with a maintainability clause addressing the mean corrective maintenance time. It identifies the remedy required when components (on an individual or statistical basis) experience specified types of failure below the MTBF or before the next overhaul. It also identifies remedies for experienced maintainability problems in the field.

MEASUREMENT: User must maintain individual time-to-failure records and mean corrective maintenance time records for the affected component. These data will be used periodically to establish contractor conformance to requirements.

RESULT: Price adjustments for failure to meet specified overhaul times; loan of spare components, accomplishment of overhaul, or repair of material; or some combination of the above, along with required design changes to effect increased maintainability.

ADVANTAGES: Motivates contractor to provide increased equipment reliability and maintainability. This, as a consequence, minimizes disruption of operations between scheduled overhauls. Measurement parameters are easily defined. Provides an additional opportunity to learn more about field performance and maintainability of products. Provides an opportunity for increased profit.

DISADVANTAGES: Requires tracking and data collection in excess of normal requirements. Can lead to litigation particularly with regard to misuse/mistreatment of equipment. Additional contractor risks involved in sale and support of products. Must rely upon user to provide data for assessments.

VII. RELIABILITY IMPROVEMENT WARRANTY (RIW)

OBJECTIVE: Motivate producer to increase equipment reliability. Reduce repair costs.

CHARACTERISTIC: Preventive and corrective.

APPLICABILITY: Normally avionics equipment at the Line Replaceable Unit (LRU), the Shop Replaceable Unit (SRU) level if fault capability isolation at the user level is available. Fixed price type contract.

DESCRIPTION: Contractor is required to repair all verified failures at no additional expense to the Air Force. A Mean-Time-Between-Failure (MTBF) guarantee may be included in a contract containing an RIW, but it must be set forth as a separate requirement. Provisions for no-cost engineering change proposals (ECPs), limits on contractor turnaround time, exclusions, Return Test OK (RTOK) limits, and usage adjustments are usually included in the RIW. Explicit assessment data and administrative requirements are also features of this approach.

MEASUREMENT: Contractual coverage usually addresses initial 3-5 year period of equipment deployment. Computational measurements for turnaround time, exclusions, and RTOKs, are based upon specified algorithms at 6 to 12 month intervals over the coverage period. Specific measurements of MTBF are not required.

RESULT: Application focuses upon improving reliability.

ADVANTAGES: Provides additional assurance that program will achieve reliability goals. Increases probability of lower life-cycle support costs. Opportunity to increase profits. Contractor opportunity to learn about equipment failure modes in operating environment.

DISADVANTAGES: Relative to MTBF guarantee approach -- may not provide strong enough incentive to improve reliability. Increases data collection and administrative requirements. Increases contractor risks over conventional acquisition approaches.

**VIII. RELIABILITY AND MAINTAINABILITY IMPROVEMENT WARRANTY
(R&MIW)**

OBJECTIVE: Motivate producer to increase equipment reliability and maintainability. Reduce repair costs.

CHARACTERISTIC: Preventive and corrective.

APPLICABILITY: Normally avionics equipment at the Line Replaceable Unit (LRU), the Shop Replaceable Unit (SRU) level if fault capability isolation at the user level is available. Fixed price type contract.

DESCRIPTION: Contractor is required to repair all verified failures at no additional expense to the Air Force as well as make design changes improving the maintainability of the affected equipment. A Mean-Time-Between-Failure (MTBF) guarantee may be included in a contract containing an R&MIW, but it must be set forth as a separate requirement. The maintainability clause may be selectively applied. Provisions for no-cost engineering change proposals (ECPs), limits on contractor turnaround time, exclusions, Return Test OK (RTOK) limits, and usage adjustments are usually included in the RIW. Explicit assessment data and administrative requirements are also features of this approach.

MEASUREMENT: Contractual coverage usually addresses initial 3-5 year period of equipment deployment. Computational measurements for turnaround time, exclusions, RTOKs, and the maintainability coefficient are based upon specified algorithms at 6 to 12 month intervals over the coverage period. Specific measurements of MTBF are not required by the R&MIW itself.

RESULT: Application focuses upon improving reliability and maintainability.

ADVANTAGES: Provides additional assurance that program will achieve reliability and maintainability goals. Increases probability of lower life-cycle support costs. Opportunity to increase profits. Contractor opportunity to learn about equipment failure and repair modes in operating environment.

DISADVANTAGES: On low cost or short time contracts, may not provide strong enough incentive to improve reliability and/or maintainability. Increases data collection and administrative requirements. Increases contractor risks over conventional acquisition approaches.

IX. MEAN TIME BETWEEN FAILURE-VERIFICATION TEST (MTBF-VT)

OBJECTIVE: Achieve improvement in operational reliability.

CHARACTERISTIC: Establish contract requirements on operational reliability with demonstration through a special verification test. Correct deficiencies and improve overall equipment performance.

APPLICABILITY: Individual black boxes or separately identifiable components. Components may be aggregated for system level commitment. Applied to equipment which is new or evolutionary in design where reliability characteristics can be predicted by analogy or prototype testing. Used where operational reliability is the predominant element of logistics support cost. Fixed price type contracts.

DESCRIPTION: The Air Force establishes and defines criteria for evaluation of contractor proposed or Air Force specified operational Mean Time Between Failure (MTBF) values. Operational MTBF is measured in verification testing of initial deployed units. Measurement usually commences at least six months after initial operational deployment. Differences between measured MTBF and MTBF targets form the basis for incentive rewards or corrective action. Incentive may be separate award fee or upward price adjustment on delivered hardware. Corrective actions may include no cost design changes, replacement of deficient items, or downward price adjustment on delivered hardware or subsequent options.

MEASUREMENT: Specified in terms of measured relationship to target MTBF.

RESULT: Contractors are responsible to ensure that items covered under MTBF guarantees meet minimum target performance values.

ADVANTAGES: Equipment reliability is enhanced; ensures careful and comprehensive design effort on most critical performance elements of systems or equipment; extends contractor responsibility to field use.

DISADVANTAGES: Operational verification tests may interfere with initial training or unit mission performance.

X. RIW WITH MTBF GUARANTEE/VERIFICATION TEST

OBJECTIVE: Motivate producer to increase equipment reliability; decrease logistics support costs.

CHARACTERISTIC: Provide contractor with a strong incentive to achieve specified reliability in the field.

APPLICABILITY: Avionics equipment, Line Replaceable Units (LRUs) or black boxes which can be tested without entry into the unit. Fixed price type contract.

DESCRIPTION: Time phased MTBF thresholds are specified together with methods for assessing MTBF. Explicit remedies are specified if contractor does not meet thresholds. Usually remedies are in the form of no-cost consignment spares, accelerated repair turnaround time, engineering analysis and equipment modifications. This approach is accompanied by explicit assessment data and administrative requirements. May be coupled with incentive arrangements such as award or incentive fee when measured performance exceeds target MTBF.

MEASUREMENT: Contractual coverage usually addresses 3-5 year period of equipment deployment. Measurements are made at 6 to 12 month intervals over the coverage period.

RESULT: Application focuses attention upon field reliability achievements. Clearly defined reliability requirements and remedies provide strong motivation to achieve reliability goals.

ADVANTAGES: High assurance that program will achieve reliability goals. Potentially lower life cycle support costs. Opportunity to increase profits. Opportunity to learn about equipment failure modes in an operating environment.

DISADVANTAGES: Requires extensive data collection and administration. Often difficult to precisely identify and cost-out risks.

**XI. RELIABILITY AND MAINTAINABILITY IMPROVEMENT WARRANTY
WITH MEAN TIME BETWEEN FAILURE VERIFICATION TEST**

OBJECTIVE: Motivate producer to increase equipment reliability and maintainability; decrease logistics support costs.

CHARACTERISTIC: Provide contractor with a strong incentive to achieve specified reliability and maintainability in the field.

APPLICABILITY: Avionics equipment, Line Replaceable Units (LRUs), Shop Replaceable units (SRUs) if the fault isolation capability is at a USAF organic level. Fixed price type contract.

DESCRIPTION: In addition to the R&MIW description, time phased MTBF thresholds are specified together with methods for assessing MTBF. Explicit remedies are specified if contractor does not meet thresholds. Usually remedies are in the form of no-cost consignment spares, accelerated repair turnaround time, engineering analysis and equipment modifications. This approach is accompanied by explicit assessment data and administrative requirements. May be coupled with incentive arrangements such as award or incentive fee when measured performance exceeds target MTBF.

MEASUREMENT: Contractual coverage usually addresses 3-5 year period of equipment deployment. Measurements are made at 6 to 12 month intervals over the coverage period.

RESULT: Application focuses attention upon field reliability and maintainability achievements. Clearly defined reliability and maintainability requirements and remedies provide strong motivation to achieve R&M goals.

ADVANTAGES: High assurance that program will achieve reliability and maintainability goals. Potentially lower life cycle support costs. Opportunity to increase profits. Opportunity to learn about equipment failure and maintenance modes in an operating environment.

DISADVANTAGES: Requires extensive data collection and administration. Often difficult to precisely identify and cost-out risks.

XII. COMPONENT RELIABILITY WARRANTY

OBJECTIVE: Contractor and Air Force mutually select and agree to the Spare Parts that should be covered under a program designed to guarantee a minimum designated level of performance reliability.

CHARACTERISTIC: Correct deficiencies and improve product performance.

APPLICABILITY: Designed for use on components for which certain minimum levels of operational performance are critical to overall satisfactory operational performance. Oriented toward "fleet-wide" reliability minimums over a specified time period. However, specified reliability levels are defined at the component or black box levels. Appropriate for use on items characterized as high technical risk, repairable and relatively high cost.

DESCRIPTION: Contractor and Air Force mutually select components for reliability coverage; components are defined as any contractor designed accessory, component, or equipment. Contractor and Air Force mutually agree on target values. Air Force generates a monthly performance report. Contractor and Air Force mutually investigate reliability deficiencies, causes, and agree on corrective action. For verified deficiencies, contractor provides at no charge, additional spare components to the Air Force and corrects, or replaces deficient items as may be required to achieve the target reliability values. If redesign of a component is necessary to technically and economically correct a deficiency, the contractor redesigns the component and provides no charge retrofit kits to the Air Force and reimburses the Air Force for any direct labor involved; "Chronic units" are returned to the contractor for no charge one for one replacement. Shop manual deficiencies are corrected through no cost revisions from the contractor. If an MTBR deficiency cannot be corrected by the contractor exactly meeting its MTBF target the contractor provides additional spare components to the Air Force as a no-charge loan. The number of loaned units is adjusted monthly based on the documented Fleet Achieved MTBF/MTBR. Loaned units are provided to the Air Force within a specified number of days (normally ten) after determination of need. The Air Force must promptly return loaned spares when the system MTBF and MTBR reaches the targeted level.

MEASUREMENT: Commences with initial delivery of parent system (aircraft, engine, etc.) and continues for a specified number of years (normally at least five) or until fleet reliability meets or exceeds measurement unit (MTBF, MTBR) target for a specified number of consecutive months (normally at least eighteen), whichever occurs last. Measurement is based on verified failures over a specified reporting period (normally six months).

RESULT: Seeks to ensure that critical systems or components are available and or perform at least equal to or better than contractual design requirements.

ADVANTAGES: Tends to drive both contractor and Government toward realistic reliability goals. Enables Government to more accurately plan and program system operation, and support. Extends contractor involvement heavily into field performance.

DISADVANTAGES: May be difficult to predict costs associated with implementation. Requires careful tracking of warranted items. Disagreements could arise over validity of measurement data, particularly where Government accomplishes maintenance and support.

XIII. CHRONIC LINE REPLACEABLE UNIT (LRU) GUARANTEE

OBJECTIVE: Identify and correct deficiencies in items which are experiencing abnormally frequent failure.

CHARACTERISTIC: Corrective.

APPLICABILITY: Selected mandatory, high cost Line Replaceable Units (LRUs) for which guaranteed Mean-Time-Between-Removal (MTBR) or similar performance criteria are established; generally used on complex items which are not subject to rapid or easy repair.

DESCRIPTION: Contractor agrees that any LRU exhibiting premature removals recurring at intervals significantly less than a specified percent of its guaranteed MTBR, will cause such LRU to be designated as a "Chronic LRU". Chronic LRUs should be replaced by the contractor at no charge and be subjected to quarantine test procedures at the contractor or an Air Force facility until the chronic fault has been isolated and repaired. Appropriate documentation should be prepared (normally by the contractor) which shows a positive correlation between the fault and its repair, impact on testing procedures, and impact on shop or production practices. Chronic LRU operating history is not countable against any MTBF or MTBR guarantee, during the month the equipment is identified and exchanged for a like unit. Duration of chronic LRU guarantee will normally be compatible with the applicability of the underlying MTBR or MTBF guarantee.

MEASUREMENT: Based on frequency of LRU removals. Frequency is measured in terms of flight hours, operating hours, chronological time, or other similar unit of measurement.

RESULT: Ensures that chronic LRUs do not distort overall performance measurements of systems or equipment.

ADVANTAGES: A mechanism is provided to remove high failure rate items from usage. Relatively easy to administer since measured parameters are clearly defined.

DISADVANTAGES: Difficult to project frequency and associated costs pertaining to replacement of chronic LRUs. Requires careful tracking of warranted item.

XIV. AVAILABILITY GUARANTEE

OBJECTIVE: Reduce the down time of critical systems/equipment.

CHARACTERISTIC: Correct deficiencies and improve overall product performance.

APPLICABILITY: Fixed-price contracts for equipment or items which operate in a continuous mode or which are considered dormant systems where operational readiness upon random demand is the critical requirement. Includes communications equipment, missiles, and munitions which are not designed for disassembly at the user level. Normally applies to equipment where high reliability is critical and corrective maintenance is either impractical or extremely costly.

DESCRIPTION: The Air Force and contractor agree contractually to a point value for availability of covered items. Point values may be specified as a threshold or a range. Equipment must provide positive indication of operability either through continuous performance or random "go/no-go" checks. Operational environment should not allow for external influences which could affect performance from lot to lot or by location. Demonstration and assessment methods are specified as part of the contract. Remedies include contractor providing additional "no cost" units, modifying, redesigning, or a combination approach in order to improve availability to the minimum specified level. Corrective action would be accomplished through specific correction of deficiencies provisions.

MEASUREMENT: Communications or electronics type equipment availability is measured during a specified duration test of one or more production lots. Missiles and munition availability is based on random sampling checks from dormant storage over an extended period of time.

RESULT: Delivered items meet minimum acceptable availability criteria based on measured performance. Corrective action is taken as necessary to raise the level of availability when deficiencies are discovered.

ADVANTAGES: Extends contractor responsibility to field use. Measurement parameters are clearly defined and relatively easy to administer.

DISADVANTAGES: Selection of sample size and period/duration of testing are critical to prediction of availability.

XV. LOGISTICS SUPPORT COST GUARANTEE

OBJECTIVE: Control and reduce selected aspects of life cycle cost and improve systems/equipment supportability.

CHARACTERISTIC: Correct deficiencies and improve product performance.

APPLICABILITY: Fixed-price contracts for newly designed or evolutionary type systems, components, or equipment.

DESCRIPTION: Contractual agreements are established which reflect target values for performance or support based on logistics parameters and "cost drivers" which are subject to later measurement in an operational environment. Award fee, no cost hardware/ software corrections, material replacement, or other arrangements are applied to individual components (or black boxes) which make up a subsystem or system. Components may be aggregated to higher hardware levels as necessary to define a system guarantee. Prediction and assessment of target value component reliability, maintainability, and unit price characteristics are established at the outset by engineering estimates or through preaward testing of prototype or advanced development hardware. An Air Force logistics support cost (LSC) model is available at the Air Force Acquisition Logistics Center (AFALC) for use in establishing expected support costs which will result from equipment design characteristics and logistics parameters.

MEASUREMENT: Based on operational evaluation testing focused on use of the LSC model to determine compliance in terms of measured logistics support cost. Differences between the measured logistics support cost and corresponding target values, or target logistics support costs, is the basis for implementation of incentives or corrective actions as provided in the contract. Testing commences approximately six to twelve months after operational deployment and continues for a specified period whose length depends on the statistical risk associated with determining compliance.

RESULT: Delivered items meet minimum logistics support cost objectives. Improvements above minimum satisfactory level are incentivized and appropriately rewarded.

ADVANTAGES: Establishes specific support cost targets prior to production which are designed to reduce Government reliability and maintainability risks. Causes both the contractor and Air Force to consider reliability, maintainability, and overall support costs as a major item during the design and development stages.

DISADVANTAGES: Contractor risk is increased due to uncertainty of predicting proposed equipment characteristics. Statistical uncertainties may be inherent in information collected during operational verification testing. Disputes may arise concerning the adequacy of Air Force maintenance and data collection during operational verification testing. Potential that operational verification testing may interfere with initial training and operational use.

GENERAL: Support cost guarantee framework and the proposed LSC model should be furnished to potential contractors for comment in the draft RFP. In response to draft RFPs, contractors should ensure that the model adequately represents the equipment being acquired and is sensitive to the potential cost drivers. Contractors would normally propose equipment reliability, maintainability, and price characteristics as part of their response to RFPs. In addition to identifying and defining proposed LSC models, the Air Force's RFP should also identify each design characteristic or logistic parameter to be proposed by offerors, programmatic information to be furnished by the Government, identification of variables subject to assessment as well as characteristics to be held constant, the methodology of measurement, and location, length, and conditions of the operational verification testing plan.

XVI. MAXIMUM PARTS COST GUARANTEE

OBJECTIVE: Establish ceiling on materials cost (covers parts and labor) per flying hour (or other unit of measure) for maintenance, repair, or overhaul.

CHARACTERISTIC: Excess cost recovery.

APPLICABILITY: Designated areas (e.g., flight controls, engines, avionics, electronics, etc.) or individual items of equipment. Mission essential complex items new to the Air Force and characterized as high technical risk, new technology, or high per unit acquisition cost.

DESCRIPTION: Contractor reimburses Air Force 100 percent or pro rata when actual materials cost for maintaining the equipment exceeds agreed to maximum. Guarantee commences with first use of product and extends for specified number of years, normally a minimum of 5 years and/or length of time item in service. Incorporate in initial and appropriate follow-on production contracts. Particularly suitable in conjunction with equipment or items developed under Design-to-Cost to obtain balance between recurring production cost and subsequent repair cost.

MEASUREMENT: Specified in terms of parts or materials cost per flying hour or other unit of measure for maintenance, repair or overhaul.

RESULT: Protects the Air Force from extraordinary unanticipated materials costs on new systems and equipment.

ADVANTAGES: Incentivizes contractors to focus design efforts on reliability and maintainability. Relatively easy to administer since measurement parameters are clearly defined.

DISADVANTAGES: May be subject to dispute based on accuracy of measurement data or reasons for removal and repair or overhaul.

XVII. SPARE PARTS LEVEL WARRANTY

OBJECTIVE: Maintain the original system or aircraft capability with a lowered mean time between (LRU or SRU) removals, (MTBR).

CHARACTERISTIC: Provides enough spares to fill the repair pipeline regardless of the MTBR.

APPLICABILITY: Fixed price contracts for equipment or items which are prime mission essential or safety of operationally essential, and designed for organic Government maintenance.

DESCRIPTION: The contractor guarantees that if the system/item exceeds a -XX% envelope from a guaranteed MTBR, spare system/items or major components will be provided at contractor expense, according to a consignment spares algorithm similar to that of the RIW. If multiple tests are made over time, appropriate adjustments will be made in the total number of spares provided or the contract cost. If the contractor exceeds a +XX% envelope the appropriate incentive may also be negotiated.

MEASUREMENT: A running monitor is maintained by the Government, subject to contractor inspection, on the Mean-Time-Between-Removal (or the Mean-Time-Between-Failure) parameter.

RESULT: The operational capability is maintained at the system or aircraft level regardless of the LRU/SRU reliability. Protects the Air Force from extraordinary unanticipated materials costs on new systems and equipment.

ADVANTAGES: Incentivizes contractors to focus design efforts on reliability, maintainability, and/or availability. Relatively easy to administer since measurement parameters are clearly defined.

DISADVANTAGES: The measurement parameter depends upon the Maintenance Data Collection System or another (manual or contractor leased) tracking system and is prone to inaccuracies from a high Could Not Duplicate (CND), Retest OK (RTOK), or "False Pull" rate.

XVIII. UTILITY FUNCTIONS GUARANTEE

OBJECTIVE: Increase reliability, durability, serviceability or other performance features of consumable items.

CHARACTERISTIC: Preventive.

APPLICABILITY: Normally consumable components such as tires, brakes, batteries. Fixed price type contract.

DESCRIPTION: A utility function or consumption index is defined.

MEASUREMENT: Level of performance achieved in a demonstration versus defined index.

RESULT: Contractor compensation to Air Force through furnishing additional units at no increase in cost.

ADVANTAGES: Ease of administration. Low cost. Low contractor risk.

DISADVANTAGES: Limited to non-complex consumable items. Liability of contractor dependent upon accuracy of Government reporting.

XIX. ULTIMATE LIFE WARRANTY

OBJECTIVE: Increase reliability to reduce premature failure.

CHARACTERISTIC: Preventive.

APPLICABILITY: Normally large, basic elements such as airframe structure and engines, but also major components such as engine rotating parts, landing gear.

DESCRIPTION: Pro-rata protection against cost of failure(s) which occur prior to end of warranted life period or otherwise require retirement or replacement prior to end of warranty.

MEASUREMENT: Specified in terms of period of time. No reporting.

RESULT: Compensation by contractor to Air Force in proportion of lost service life to warranted service life.

ADVANTAGES: Ease of administration -- especially since measurement parameters are easily defined. Similar advantages to standard commercial guarantees.

DISADVANTAGES: Limited use -- because of difficulty of keeping track of use measurement and conditions of use. Lack of use control or data.

GENERAL: Widely used by airline industry in purchasing airframes and engines.

XX. COMMERCIAL SERVICE LIFE WARRANTY

OBJECTIVE: Provides extended coverage for anticipated service life.

CHARACTERISTIC: Preventive.

APPLICABILITY: Major systems, subsystems and structural components.

DESCRIPTION: Contractor shares, after expiration of specified-number-of-month-warranty, in cost of materials required to correct any defects or breakage in covered items.

MEASUREMENT: Begins at expiration of primary warranty is prorated on specified basis for an established period thereafter.

RESULT: Contractor provides compensation based on 100 percent at delivery decreasing to 0 percent at end of specified number of years.

ADVANTAGES: Provides extended protection to primary elements for substantial time after delivery. Coverage is fleetwide. Liability limited to pro-rata share.

DISADVANTAGES: Extended coverage is limited to specified elements. Protection decreases pro rata by time, i.e. total coverage does not remain constant.

XXI. SOFTWARE DESIGN COMMITMENT GUARANTEE

OBJECTIVE: Improve software development practices; improve software maintenance characteristics.

CHARACTERISTIC: Correct deficiencies and improve product performance.

APPLICABILITY: Software in the early development phase. Large or small software packages. Embedded or ADP software.

DESCRIPTION: Provide incentives to develop software packages that require little or no routine maintenance, yet are easily maintained when required. The requirements will motivate efficient software designs using such techniques as a maintenance phase, modular programming, well documented code, and thorough test packages. Elements of design maintainability include:

- Good documentation during development, at the time of acceptance, and through the support period.

- Development of debug and test diagnostics above that simply required to pass an acceptance test.

- Development of software that will run on different machines. This will promote flexibility in future uses of the software and can provide considerable cost avoidance.

Software design features to be controlled must be identified together with an evaluation approach. Successful demonstration of these features can result in an award or incentive fee. Failure to demonstrate these aspects would result in corrective action requirements.

MEASUREMENT: Delivered software products are measured against design requirements.

RESULT: Delivered items satisfy design requirements, or if defective, are improved to design requirement level.

ADVANTAGES: Lower support costs for software. Pre-production assessment of software design. Increased maintenance or update capability. Early identification of critical features or software. Improved opportunities for common designs. Better cost estimates for production and subsequent software maintenance.

DISADVANTAGES: Standard metrics and measurement procedures not readily available for software.

XXII. LRU SOFTWARE CONFIGURATION CONTROL AND SUPPORT AGREEMENT

OBJECTIVE: Guarantee software and hardware compatibility as well as correct any software errors.

CHARACTERISTIC: Corrective.

APPLICABILITY: Avionics boxes or systems that include both hardware and software. Generally, applied in conjunction with some form of hardware warranty, thus obtaining a system warranty.

DESCRIPTION: If hardware changes (due to contractor responsibility) result in a requirements for a software change, that change and the resulting configuration control will be at the contractor's expense; if errors are discovered in the software, then changes and the resulting configuration control will be at the contractor's expense; if, for any reason, software changes are required to improve system performance to specified levels, then these changes and the resulting configuration control shall be at the contractor's expense.

MEASUREMENT: Specified in terms of conformance to configuration or performance criteria.

RESULT: Delivered items conform to contractual requirement or are replaced as necessary to maintain conformance with equipment configuration changes.

ADVANTAGES: All required reprogramming would be accomplished at no change in cost for a specified number of years of operation. Contractor retains configuration control.

DISADVANTAGES: Potential conflicts with any organically performed "upgrades" to the software or needs to "improve" or "expand" capability beyond contract requirements.

XXIII. FAULT DETECTION, ISOLATION, AND REPAIR WARRANTY

OBJECTIVE: Reduce the Mean Troubleshooting Time (MTT) for the guaranteed system/item to a guaranteed level, and maintain that reduced MTT for a specified period of time.

CHARACTERISTIC: Correct Deficiencies in the Failure Modes and Effects Analysis (FMEA), the Optimum Repair Level Analysis (ORLA), the Technical Orders, the Test System Hardware, or the Test Software when they impact the operational availability of the end item.

APPLICABILITY: Fixed price contracts for operational systems or aircraft that are intended for organic Government support.

DESCRIPTION: The contractor guarantees that the FMEA; and the equipment, software, and technical orders provided will find and isolate XX% of the possible faults in the system, item, or SRU/TRU within a given average or mean time. Modifications to the system, item, SRU/TRU, support equipment, software, or technical orders to achieve the agreed to percentage of faults found, isolated, and repaired in the agreed to time frames; and any reaccomplishment of the FMEA or the ORLA will be at contractor expense. Any fault found in use that is not listed in the FMEA will cause reaccomplishment of the FMEA and the ORLA. Any repair action required to create the agreed to availability of the system, item, or SRU/TRU: which is not listed in the ORLA; will cause reaccomplishment of the ORLA. Isolation will be to an ambiguity group of less than X. Any modification to any deliverable required to effect the reduction of an ambiguity group will be at the contractor's expense.

MEASUREMENT: Based on specific MTT, Mean Time To Repair MTTR, or other similar unit of measure. Measurement commences with delivery and acceptance by the Air Force.

RESULT: When a fault cannot be identified, isolated, or repaired at the required level a determination is made by the PCO and the using MAJCOM/LG-MA as to where the fault should be found, isolated, or repaired and the contractor is required to modify the support system to find, isolate, and/or repair the fault.

ADVANTAGES: Extends contractor responsibility for the overall support system to field use. Measurement parameters are clearly defined and relatively easy to administer..

DISADVANTAGES: May be difficult to isolate cause of deficiencies in terms of test equipment, test procedures, or inherent deficiencies in units being tested. Requires careful contract wording, an awareness of the remedies available, an understanding of each problem's solution, and the submittal of firm requirements.

XXIV. TEST AND REPAIR IMPROVEMENT GUARANTEE

OBJECTIVE: Ensure that test equipment and applicable procedures, when properly used, will reliably demonstrate MTBR or MTBF performance guarantees.

CHARACTERISTIC: Corrective and improvement.

APPLICABILITY: Test equipment for items which are mission essential and are covered by performance specifications; normally applicable to complex test equipments which are limited in number, are high cost and are critical to condition or performance verification.

DESCRIPTION: Contractor guarantees that units tested in accordance with published procedures with approved or specifically recommended test equipment, a specified percent (normally ninety) of the units tested will demonstrate an MTBR (or other unit of measure) greater than a specified percent of the MTBF guarantee. Chronic units are excluded from the count unless identified to a test deficiency. Deficient test equipment or procedures should be improved to conform within a specified number of days (normally ninety) of being determined deficient at the contractor's expense. Contractor also guarantees that mutually agreeable, comprehensive troubleshooting information should be provided which correlates with published test procedures. Duration of guarantee is usually five years or eighteen consecutive months of demonstration, whichever occurs last.

MEASUREMENT: Based on specific MTBR, MTBF, or other similar unit of measure. Measurement commences with delivery and acceptance by the Air Force.

RESULT: Ensures that test equipment and associated test procedures are adequate predictors or measures of desired field performance objectives. Ensures that deficiencies or procedures are correctable to satisfactory levels.

ADVANTAGES: Extends contractor responsibility for accurate testing to post acceptance period.

DISADVANTAGES: May be difficult to isolate cause of deficiencies in terms of test equipment, test procedures, or inherent deficiencies in units being tested. Requires careful tracking of warranted items.

XXV. METHOD OF TEST GUARANTEE

OBJECTIVE: Establishes guarantee for accuracy of peculiar test equipment and method of testing for specified LRUs.

CHARACTERISTIC: Preventive.

APPLICABILITY: Applies to testing LRUs with peculiar test equipment.

DESCRIPTION: At no charge, contractor provides dedicated test equipment and method of testing specified LRUs. Contractor also provides no charge software programs and update service for a specified period of years. Testing is oriented toward verification and acceptance of LRUs based upon testing LRU operating modes and functions. Contractor test methods and equipment will normally cover subassemblies and detail parts.

MEASUREMENT: Measures effectiveness of peculiar test equipment and test methods.

RESULT: Assures that the equipment and test methods used to evaluate operating modes and functions of specified LRUs are accurate.

ADVANTAGES: Provides continuous guarantee that testing of LRUs will be accurate.

XXVI. QUALITY OF TRAINING WARRANTY

OBJECTIVE: Insure the level of skill and knowledge available in the repair shops at all levels of maintenance.

CHARACTERISTIC: Corrects voids in system training brought about by configuration changes and oversights.

APPLICABILITY: Fixed price contracts for Items intended for Government organic maintenance.

DESCRIPTION: The contractor agrees that all of the required Measurable Symbols of Behavior (MSBs) required to properly troubleshoot and repair the delivered end items, in their final configuration, will be trainable tasks and retainable knowledge to a specified level of intelligence and experience. The contractor further agrees that all of the data required to train those tasks will be provided to the Government; that any training conducted by the contractor will be from the same data provided to the Government; and that if the Government requires additional training or overcome a CND/RTOK or basic knowledge/skill problem within X years, the training or training data required will be provided at contractor expense.

MEASUREMENT: The operating MAJCOM monitors the training and the MTT/MTTR.

RESULT: If a problem arises a determination is made between the operating MAJCOM, the Air Training Command, and the PCO concerning the depth and level of the training deficiency. The contractor provided additional training or training materials will satisfactorily solve the training problem.

ADVANTAGES: Extends contractor responsibility for training materials into the field deployment time frame. Provides for modification of training materials as the delivered hardware configuration changes.

DISADVANTAGES: Measurement parameters are not firm or easily defined.

XXVII. REWARRANTY OF REPAIR/OVERHAULED EQUIPMENT

OBJECTIVE: Provides warranty coverage for items which have been overhauled, repaired, or furnished as replacements by a contractor.

CHARACTERISTIC: Corrective.

APPLICABILITY: Items overhauled, repaired, or furnished by a contractor as a replacement for correction of defects in design, material, or workmanship. Fixed price type contracts.

DESCRIPTION: Contractor repaired or replacement spare parts furnished to the Air Force as a result of defects in design, material, or workmanship are rewarranted for the unexpired remainder of the warranty period specified in the underlying contract or within a specified number of months (normally twelve) after delivery of the corrected item, whichever period is negotiated as applicable in the rewarranty agreement.

MEASUREMENT: Begins at acceptance of repair or replacement parts by the Government.

RESULT: Contractor's liability for correction or replacement for items continues for specified period.

ADVANTAGES: Correction of deficiencies discovered after acceptance of repair or replacement item.

DISADVANTAGES: Requires careful tracking of warranted items. Precludes the Air Force from accomplishing the correction of deficiencies. Burden of proof of deficiency rests with the Government.

XXVIII. REPAIR/EXCHANGE AGREEMENTS

OBJECTIVE: Provide for rapid contractor replacement through specified turnaround time of defective items of equipment or components.

CHARACTERISTIC: Corrective.

APPLICABILITY: Used where it is not cost effective to develop Air Force organic support. Particularly suitable for commercial items. May be applied to the component or black box (module or sub-assembly) level. May be used as an interim mode of contractor support pending establishment of full organic capability. Is also suitable where the complexity level is particularly high or for items which are expected to have a limited frequency of repair. Fixed price type contract.

DESCRIPTION: Contractors establish an inventory of replacement units to meet expected Government demand requirements within required turnaround times. Inventory levels are periodically adjusted to meet expected demand rates. Contractors also establish or provide for necessary repair capability including provision for surge requirements as necessary. Buy out of contractor inventories by the Government at the conclusions of these agreements is normally an item for negotiation based upon equipment amortization concepts. Payment for repair or exchange items should be established on a fixed-price per unit basis. An end of agreement adjustment may be established to cover excessive usage by the Government, higher than anticipated unit installations, delays in returning defective units, premium time to meet surge requirements, liquidated damages caused by lack of available exchange units, excessive contractor inventory levels, and excessive amortization costs realized.

MEASUREMENT: Normally expressed in terms of frequency of expected repair or exchange and associated turnaround time.

RESULT: Objective is to ensure replacement item availability within specified turnaround time.

ADVANTAGES: Reduces Air Force inventory and management requirements. Precludes demand for critical skilled repair personnel. Will be significantly more cost effective than establishing unique Air Force capabilities for items characterized by low volume turnover. Support costs and availability replacement items will be more predictable and programmable. Extends contractor responsibility for participation to the field performance phase.

DISADVANTAGES: Air Force is directly dependent upon contractor support for potentially critical items. May preclude cost effective utilization of Air Force repair facilities.

APPENDIX B. TYPICAL CLAUSES FOR TYPICAL SITUATIONS

B.1. THE TYPICAL SITUATION

Experience emphasizes the fact that no one guarantee provision, or warranty type, is going to cure all. In Figure 4-2 where a block is labeled High Risk or indicated Optional or Addition, illustrates the narrow applicability band of any given clause.

The example clauses included here are intended to be used in their entirety, or tailored to meet the needs of your program.

Several of the included subclauses are tools to make your warranty clause work more effectively.

These clauses have been either extracted from contracts or written upon request, and are intended for insertion into a contract when insertion makes good business sense. Table B-1 is an index of sample clauses.

TABLE B-1 SAMPLE CONTRACT CLAUSES

<u>NO.</u>	<u>TITLE</u>	<u>Pg.</u>
<u>1</u>	Warranty of Weapon Systems Under 10 U.S.C. 2403.	<u>B- 3</u>
<u>2</u>	Reliability and Maintainability Warranty	<u>B-11</u>
<u>3</u>	Model Engine Warranty.	<u>B-25</u>
<u>4</u>	Storage Verification Guarantee.	<u>B-31</u>
<u>5</u>	Reliability Improvement Warranty.	<u>B-39</u>
<u>6</u>	Mean-Time-Between-Failure Verification Test/Guarantee.	<u>B-57</u>

SAMPLE #1

WARRANTY OF WEAPON SYSTEMS
UNDER 10 U.S.C. 2403

(a) Definitions.

"Acceptance," as used in this clause, means the execution of an official document (e.g., DD Form 250) by an authorized representative of the Government by which the Government assumes for itself, or as an agent of another, ownership of existing and identified supplies, or approves specific services rendered, as partial or complete performance of the contract.

"Correction," as used in this clause, means the elimination of a defect.

"Defect," as used in this clause, means any condition or characteristic, in any supplies or services furnished by the Contractor under the contract, that is not in compliance with the requirements of the contract.

"Supplies," as used in this clause, means the end items furnished by the Contractor and related services requirements under this contract. Except when this contract includes the clause entitled "Warranty of Tech Data", supplies also means "data."

(b) Specific Warranties. The contractor hereby warrants--

(1) Design/Manufacturing Conformance Warranty:

For*....., that line item(s), will conform to all design and manufacturing requirements specifically delineated in this contract (including but not limited to all specifications and statements of work), and in any amendments thereto. Design and manufacturing requirements include, but are not limited to, all structural and engineering plans and manufacturing particulars, including, but not limited to, precise measurements, tolerance, materials, processes and finished product tests for the item being produced.

[* Specify time period(s) for duration of warranty.]

(2) Material and Workmanship Warranty:

For*....., that line items(s) at the time of delivery, are free from all defects in materials and workmanship.

[* Specify time period(s) for duration of warranty.]

(3) Essential Performance Warranty:

For*..... , that line item(s) will conform to the essential performance requirements for such item(s) as specifically delineated in this contract and in any amendments thereto. For purposes of this warranty, the essential performance requirements are delineated as follows:

For line item _____ :
[delineate performance requirements]

For line item _____ :
[delineate performance requirements]

[*Specify time period(s) for duration of warranty. If line item has no essential performance requirements (e.g., pure build to print), delete this paragraph.]

(4) Other Performance Warranty:

For*..... , that line item(s) and each component thereof conform to all other performance requirements for such items delineated in this contract and any modifications thereto.

[Specify time period(s) for duration of warranty. If a warranty is not desired on the other performance requirements, delete this paragraph.]

(c) Contractor's obligations.

(1) The Contractor's warranties under this clause shall apply only to those defects discovered by either the Government or the Contractor during the period specified (as applicable) in (b)(1), (b)(2), (b)(3), and/or (b)(4) above.

(2) If the Contractor becomes aware at any time before acceptance by the Government (whether before or after tender to the Government) that a defect exists in any supplies or services, the Contractor shall (i) promptly correct the defect or (ii) promptly notify the Contracting Officer, in writing, of the defect, using the same procedures prescribed in paragraph (c)(3) of this clause.

(3) If the Contracting Officer determines that a defect exists in any of the supplies or services accepted by the Government under this contract, the Contracting Officer shall promptly notify the Contractor of the defect, in writing, within.....[Contracting Officer shall insert the specific period of time in which notice shall be given to the Contractor; e.g., "30 days after delivery of the nonconforming supplies;" "90 days after the last delivery under this contract;" or "90 days after discovery of the defect."] Upon timely notification of the existence of a defect in accepted supplies or services, the Contractor shall submit to the Contracting Officer, in writing

within..... [Contracting Officer shall insert period of time] a recommendation for corrective actions, together with supporting information in sufficient detail for the Contracting Officer to determine what corrective action, if any, shall be undertaken. When, pending completion of corrective action to eliminate a defect,; the Contracting Officer determines that an interim repair or replacement is necessary to; maintain continued weapon system operation, the Contracting Officer may direct the Contractor, in addition to and concurrent with the development of recommendation and corrective action, to provide immediate interim repairs or replacements as necessary to allow continued weapon system operation.

(4) The Contractor, notwithstanding any disagreement regarding the existence of, or responsibility for, a defect, shall promptly comply with any timely written direction from the Contracting Officer to correct or partially correct a defect, at no increase in the contract price. If it is later determined that an alleged defect is not a defect subject to these warranties, the contract price will be equitably adjusted.

(5) The Contractor shall also prepare and furnish to the Contracting Officer data and reports applicable to any correction required under this clause (including revision and updating of all other affected data called for under this contract) at no increase in the contract price.

(6) In the event of timely notice of a decision not to correct or only to partially correct, the Contractor shall submit a technical and cost proposal within [Contracting Officer shall insert period of time] to amend the contract to permit acceptance of the nonconforming supplies or services in accordance with the revised requirement, and an equitable reduction in the contract price shall promptly be negotiated by the parties and be reflected in a supplemental agreement to this contract.

(7) Any supplies or parts thereof corrected or furnished in replacement and any services reperformed shall also be subject to the conditions of this clause to the same extent as supplies or services initially accepted. The warranties, with respect to these supplies, parts, or services, shall be equal in duration to those set forth in paragraph (b) of this clause, and shall run from the date of delivery of the corrected or replaced supplies.

(8) If the Government returns supplies to the Contractor for correction or replacement under this clause, the Contractor shall be liable for transportation charges up to an amount equal to the costs of transportation by the usual commercial method of shipment from the place of delivery specified in this contract (irrespective of the f.o.b. point or the point of acceptance) to the Contractor's plant and return to the place of delivery specified in this contract. The Contractor shall also bear responsibility for the supplies while in transit.

(d) Remedies Available to the Government.

(1) The rights and remedies of the Government provided in this clause--

(i) Shall not be affected in any way by any terms or conditions, of this contract, concerning the conclusiveness of inspection and acceptance;

(ii) Are in addition to, and do not limit, any rights afforded to the Government by any other clause of this contract; and

(iii) Shall survive final payment.

(2) Within [Contracting Officer shall insert period of time] after receipt of the Contractor's recommendations for corrective action and adequate supporting information, the Contracting Officer, using sole discretion, shall give the Contractor written notice not to correct any defect, or to correct or partially correct any defect within a reasonable time at [Contracting Officer shall insert locations where corrections may be performed].

(3) In no event shall the Government be responsible for any extension or delays in the scheduled deliveries or periods of performance under this contract as a result of the Contractor's obligations to correct defects, nor shall there be any adjustment of the delivery schedule or period of performance as a result of the correction of defects unless provided by a supplemental agreement with adequate consideration.

(4) This clause shall not be construed as obligating the Government to increase the contract price.

(5) (i) The Contracting Officer shall give the Contractor a written notice as required in paragraph (d)(5)(ii) below, specifying any failure or refusal of the Contractor to --

(A) Present a detailed recommendation for corrective action as required by paragraph (c)(3) of this clause;

(B) Correct defects as directed under paragraph (c)(4) of this clause; or

(C) Prepare and furnish data and reports as required by paragraph (c)(5) of this clause.

(ii) The notice shall specify a period of time following receipt of the notice by the Contractor in which the Contractor must remedy the failure or refusal specified in the notice.

(6) If the Contractor does not promptly comply with the Contracting Officer's written notice in paragraph (d)(5)(i) of

this clause or if the Contracting Officer elects not to require the Contractor to take full corrective action under (d)(2) above, the Contracting Officer may by contract or otherwise --

(i) Correct the supplies or services; or

(ii) Replace the supplies or services, and if the Contractor fails to furnish timely disposition, instructions, the Contracting Officer may dispose of the nonconforming supplies for the Contractor's account in a reasonable manner, in which case the Government is entitled to reimbursement from the Contractor, or from the proceeds, for the reasonable expenses of care and disposition as well as for excess costs incurred or to be incurred;

(iii) Obtain applicable data and reports; and

(iv) Charge the Contractor for the costs reasonably incurred by the Government.

(7) The Contractor shall be liable for the reasonable cost of disassembly and/or reassembly of larger items when it is necessary to remove the supplies to be inspected and/or returned for correction or replacement.

(e) Exclusions.

(1) The Contractor shall not be responsible under this clause for the correction of defects in Government-furnished property, except for defects in installation, unless the Contractor performs or is obligated to perform any modifications or other work on such property. In that event, the Contractor shall be responsible for correction of defects that result from the modifications or other work on such property.

(2) Except as otherwise specified in this contract, combat damage is not covered by these warranties to the extent the defect in question is proximately caused by such combat damage.

(f) Limitations.

(1) These warranties will not, in any way, be voided by any Government performed repair, accomplished in accordance with standard Military Service maintenance procedures, of any item, or component thereof, covered by these warranties.

(2) The warranty provisions of this clause do not cover liability for loss, damage, or injury to third parties, nor so they cover consequential damages.

(3) All implied warranties of merchantability and "fitness for a particular purpose" are excluded from any obligation under this contract.

(g) Price of Warranties*

(1) It is agreed that, with respect to the following line items, the amounts indicated represent the portion of the contract price attributable to warranties under this clause

<u>Line</u>	<u>Total Price of</u>	<u>Portion</u>	<u>Portion</u>
<u>Item(s)</u>	<u>All Warranties</u>	<u>Attributable</u>	<u>Attributable</u>
	<u>Under This</u>	<u>to Design</u>	<u>to Material/</u>
	<u>Clause</u>	<u>Manufacturing</u>	<u>Workmanship</u>
		<u>Warranty</u>	<u>Warranty</u>
.....	\$ _____	\$ _____	\$ _____
.....	\$ _____	\$ _____	\$ _____

	<u>Portion</u>	<u>Portion</u>
	<u>Attributable</u>	<u>Attributable</u>
	<u>to Essential</u>	<u>to Other</u>
	<u>Performance</u>	<u>Performance</u>
	<u>Warranty</u>	<u>Warranty</u>
.....	\$ _____	\$ _____
.....	\$ _____	\$ _____

(2) In the event any amendments or other changes to this contract affect Contractor's costs of warranty compliance, the contract price and price reflected in (g)(1) above, will be equitably adjusted, upward or downward, in accordance with the "changes" clause of this contract.

[* This paragraph may be used when the warranty is not a separately priced line item.]

(h) Resolution of Conflicts in Warranty Requirements. In the event a requirement under the Design/Manufacturing Conformance Warranty conflicts with a warranted performance requirement, the Contractor shall promptly inform the Contracting Officer of such conflict and, at no increase in contract price, provide the Contracting Officer with any design/manufacturing or other changes necessary to ensure compliance with warranted performance requirements. Upon Contracting Officer approval of such proposed changes, they shall, unless otherwise directed by

the Contracting Officer, be implemented at no increase in contract price for all affected supplies or services purchased under this contract.

[This optional paragraph is appropriate for use where the contractor has responsibility for item design.]

(End of Clause)

ALTERNATE I (JAN 1985). For those contracts in which it is not desired to specifically identify all Design/Manufacturing Requirements and/or all Essential Performance Requirements, either one or both of the following alternatives to paragraphs (b)(1) and (b)(3) may be used.

(1) Design/Manufacturing Conformance Warranty.

For*,....., that line items, will conform to all design and manufacturing requirements specifically delineated in this contract and in any amendments thereto. Such specifically delineated design and manufacturing requirements shall be deemed to include all such requirements specified in the Statement of Work, specifications, and other provisions of this contract and any amendments thereto, but do not include any design or manufacturing provision expressly stated to be a goal or objective, provided that, unless the word "goal" or "objective" is expressly used in conjunction therewith, it shall be deemed a requirement subject to this clause. Design and manufacturing requirements include, but are not limited to, all structural and engineering plans and manufacturing particulars, including, but not limited to precise measurements, tolerances, materials, processes and finished product tests for the item being produced.

[* Specify time period(s) for duration of warranty.]

(3) Essential Performance Warranty.

For*,....., that line items, will conform to the essential performance requirements for such item(s) as specifically delineated in this contract and in any amendments thereto. For the purposes of the essential performance warranty, the "essential performance requirements" referred to are all those performance requirements delineated in the Statement of Work, specifications, and other provisions of this contract and any amendments thereto. Such "essential performance requirements" do not, however, include any performance provision expressly stated to be a goal or objective, provided that, unless the word "goal" or "objective" is expressly used in connection therewith, it shall be deemed a requirement subject to this clause.

[* Specify time period(s) for duration of warranty.]

SAMPLE #2

NOTE 1

RELIABILITY AND MAINTAINABILITY WARRANTY:

(a) Introduction;

The purpose of the (NOTE 1) Reliability and Maintainability Warranty is to create contractor incentives to produce highly reliable and easily maintainable (NOTE 1) systems/equipment, and to provide correction of deficiencies in accordance with 10 U.S.C. 2403. This equipment is intended for organic Air Force use and maintenance, worldwide, and on very short notice.

(b) Definitions;

(i) "Acceptance," as used in this clause means the execution of an official document (e.g., DD Form 250) by an authorized representative of the Government by which the Government assumes for itself, or as an agent of another, ownership of existing and identified supplies, or approves specific services rendered, as partial or complete performance of the contract.

(ii) "Correction," as used in this clause, means the elimination of a defect.

(iii) "Defect," as used in this clause, means any condition or characteristic in any supplies or services furnished by the Contractor under the contract that is not in compliance with the requirements of the contract.

(iv) "Major Subsystem," as used in this clause, means the next lowest system, assembly, or part from the item under discussion; at the time of the discussion.

(v) "Supplies," as used in this clause, means the end items furnished by the contractor and related services required under this contract. Except when this contract includes the clause entitled Warranty of Data, supplies also means "data".

(vi) "Remove and Replace" as used in this clause means all actions required to remove the individual named subassembly or component from a completely assembled contract deliverable item, to reinstall that individual named subassembly or component into the contract deliverable item, and completely reassemble the contract deliverable item

(vii) "Common Hand Tools" as used in this clause means the tools listed in the Common Hand Tools list (see using MAJCOM LGM) contained in the request for proposal. Universal joint adapters and flexible socket wrench extensions are not common hand tools.

(viii) "Crew size" as used in this clause means the number of persons required by either the appropriate OSHA standard, or the United States either by regulation or MIL STD, to effect the safe and reasonable handling of any task required to remove and replace any subassembly or component delivered pursuant to this contract.

(ix) "Maintenance Procedures" as used in this clause means any actions required to remove and replace a subassembly or component according to the definition of remove and replace.

(x) "Technical Orders" as used in this clause means those documents purchased and delivered under CLIN _____ (DI _____) to be used for the operation and maintenance of
NOTE1

(xi) "Removeable Object" as used in this clause means each object deemed by the United States to be a remove and replace item, according to the definition of remove and replace, at the maintenance level under discussion at the time of discussion.

(c) Specific Warranties. The contractor hereby warrants--

(1) Design/Manufacturing Conformance Warranty.

For NOTE 3, and for the MTBF value warranted in (c) (5) below, that line item(s) _____ will conform to all design and manufacturing requirements specifically delineated in this contract and in any amendments thereto. Such specifically delineated design and manufacturing requirements shall be deemed to include all such requirements specified in the Statement of Work, specifications, and other provisions of this contract and any amendments thereto, but do not include any design or manufacturing provision expressly stated to be a goal or objective, provided that, unless the word "goal" or "objective" is expressly used in connection therewith, it shall be deemed a requirement subject to this clause. Design and manufacturing requirements include, but are not limited to, all structural and engineering plans and manufacturing particulars, including, but not limited to, precise measurements, tolerances, materials, processes, and finished product tests for the item being produced.

(2) Material and Workmanship Warranty.

For NOTE 3, and for the MTBF warranted in (c) (5) below, that line item(s) _____ at the time of delivery, are free from all defects in materials and workmanship.

(3) Essential Performance Warranty.

For NOTE 3 and for the MTBF warranted in (c)(5) below, that line item(s) _____ will conform to the essential performance requirements for such item(s) as specifically delineated in this contract and in any amendments thereto. For purposes of the essential performance warranty, the "essential performance requirements" referred to are all those performance requirements delineated in the statement of work, specifications, and other provisions of this contract and any amendments thereto. Such "essential performance requirements" do not, however, include any performance provision expressly stated to be a goal or objective, provided that, unless the word "goal" or "objective" is expressly used in connection therewith, it shall be deemed a requirement subject to this clause.

(4) Other Performance Warranty

For NOTE 3, and for the MTBF warranted in (c)(5) below, that line item(s) _____ and each component thereof conform to all other performance requirements for such items delineated in this contract and any modifications thereto.

(5) Reliability Warranty.

For NOTE 3, or according to the formula of TOLU/TMA

where TOLU = total operating life units and

TMA = total maintenance actions documented as service, reseal, remove and replace (without regard to time elapsed between the two), or repair on AFTO form 349.

for a total of _____ life units, that line item(s) _____ and each major subsystem thereof shall continue to conform to the special warranties contained in (c)(1), (c)(2), (c)(3), and (c)(4) above when used and maintained in accordance with the use and maintenance concepts pertinent to this contract and any amendments thereto.

(6) Organizational/Field Level Maintainability Warranty

(a) This warranty covers only those maintenance actions determined by the finally accepted Optimum Repair Level Analysis (ORLA) (DI _____) to be performed at the "Organizational" or "Field" level.

(b) The Contractor will design and manufacture the NOTE 1 to a Maintainability Coefficient of NOTE 6), but no less than NOTE 3, according to the formula of;

$$MC = (MTBF)/[a + (2t)^2 + k + (2e)^2 + z + b^2 + c^2 + (2m)^3]$$

where MTBF = Mean Time Between Failure,

(a) = the number of separate tasks required to effect R&R of the given item or assembly,

(t) = the number of special tools required to effect R&R of the given item or assembly,

(k) = the number of common tools required to effect the R&R

(e) = the number of pieces of Support Equipment (SE) required to effect R&R of the given item or assembly,

(z) = the sum of the weight in lbs. and the length, width, and height in inches, of the given item or assembly,

(b) = the number of different Technical Orders (TOs) required to assemble all of the steps required to R&R the item or assembly,

(c) = the crew size required to R&R the item or assembly,

and (m) = the number of other items or assemblies that must be removed to gain access to the subject item or assembly.

(c) In no event will an Engineering Change Proposal (ECP) be offered without recomputing the Maintainability Coefficient, and in no event will the proposed ECP lower the current (at the time of offer) Maintainability Coefficient value.

(7) Depot Level Maintainability Warranty

(a) This warranty covers only those maintenance actions determined by the finally accepted ORLA to be performed at the "Depot" level

(b) The Contractor will design and manufacture the NOTE 1 to a Maintainability Coefficient of NOTE 6, but no less than NOTE 3, according to the formula in (6)(b) above.

(c) In no event will an ECP be offered without recomputing the Maintainability Coefficient, and in no event will

the proposed ECP lower the current (at the time of offer) Maintainability Coefficient value.

(8) Optional Maintainability Algorithms

(a) This algorithm is adapted from (6)(b) to emphasize maintainability parameters. It is $MC = \text{the square root of the } MTBF/[a + (2t)^2 + (k) + (2e)^2 + z + b^2 + c^2 + (2m)^3]$

(b) This algorithm and the algorithm in (6)(b) can be multiplied by appropriate factors of 10 to create the desired visibility and flexibility.

(9) Optional Maintainability Warranty

(a) The Contractor will;

(i) Design and manufacture the NOTE 1 such that Government personnel can remove and replace each subassembly of the delivered end items CLIN _____ within a maximum mean time of NOTE 3, and R&R any subassembly in a maximum total time of NOTE 3.

(ii) Design and manufacture the NOTE 1 such that Government personnel can R&R each component of any subassembly of the delivered end items within a maximum mean time of NOTE 3, and R&R any component of any subassembly in a maximum total time of NOTE 3.

(iii) Design and manufacture the NOTE 1 such that all maintenance tasks on all end items, major subsystems, subassemblies, and their component parts can be accomplished with common hand tools.

(iv) Design and publish (or cause to be designed and published) the technical orders for NOTE 1 and all major subsystems; such that each and every task, subtask, step, note, warning, and caution required to effect any required maintenance task within the NOTE 1 system be accurately reflected, in the correct sequence, and in the appropriate place, within the appropriate technical order.

(v) Design and manufacture the NOTE 1 such that the required crew size to R&R any removeable assembly is no more than NOTE 3, any component of a removeable assembly is no more than NOTE 3, and any removeable object is no more than 1. This R&R will be accomplished with the common hand tools called out, and the technical orders and support equipment furnished as contract deliverables.

Structural, load-bearing, rivitted or welded components such as wings, Bulkheads, or chassis will be exempt from this requirement.

Engines and engine core assemblies, flight control surfaces, and landing gears are expected to require larger crew sizes than avionics components.

(10) Passthrough Warranties.

The Contractor will procure; for all component parts, subassemblies, and support equipment not manufactured by the contractor that are to be delivered under the contract; the same warranties/guarantees as the Contractor is obligated to provide under this clause. Where commercial warranties/guarantees are available to commercial customers in significant quantities, commercial warranties/guarantees will be procured. These warranties/guarantees will be procured by the Contractor as an agent for the Government, intended for use by the Government, and at no additional cost to the Government.

(d) Contractor's Obligations.

(1) The contractor's warranties under this clause shall apply only to those defects discovered by either the Government or the Contractor during the period specified (as applicable) in (c)(1), (c)(2), (c)(3), (c)(4), and/or (c)(5) above.

(2) If the contractor becomes aware at any time before acceptance by the Government (whether before or after tender to the Government) that a defect exists in any supplies or services, the contractor shall (i) promptly correct the defect or (ii) promptly notify the Contracting Officer, in writing, of the defect; using the same procedures prescribed in paragraph (d)(3) of this clause.

(3) If the Contracting Officer determines that a defect exists in any of the supplies or services accepted by the Government under this contract, the Contracting Officer shall promptly notify the Contractor of the defect, in writing, within NOTE 3 of the discovery of the defect. Upon timely notification of the existence of a defect, the Contractor shall submit to the contracting officer, in writing, within NOTE 3 days, a recommendation for corrective actions, together with supporting information in sufficient detail for the Contracting Officer to determine what corrective action, if any, shall be undertaken. When, pending completion of corrective action to eliminate a defect, the Contracting Officer determines that an interim repair or replacement is necessary to maintain continued weapon system

operation, the Contracting Officer may direct the Contractor, in addition to and concurrent with the development of recommendation and corrective action, to provide immediate interim repairs or replacements as necessary to allow continued weapon system operation.

(4) The contractor, notwithstanding any disagreement regarding the existence of, or responsibility for, a defect, shall promptly comply with any timely written direction from the Contracting Officer to correct or partially correct a defect, at no increase in the contract price. If it is later determined that an alleged defect is not a defect subject to these warranties, the contract price will be equitably adjusted.

(5) The Contractor shall also prepare and furnish to the Contracting Officer data and reports applicable to any correction required under this clause (including revision and updating of all other affected data called for under this contract) at no increase in the contract price.

(6) In the event of timely notice of a decision not to correct or only to partially correct, the contractor shall submit a technical and cost proposal within NOTE 3 days, to amend the contract to permit acceptance of the nonconforming supplies or services in accordance with the revised requirement, and an equitable reduction in the contract price shall promptly be negotiated by the parties and be reflected in a supplemental agreement to this contract.

(7) Any supplies or parts thereof corrected or furnished in replacement, and any services reperformed shall also be subject to the conditions of this clause to the same extent as supplies or services initially accepted. The warranties with respect to these supplies, parts, or services, shall be equal in duration to those set forth in paragraph (c) of this clause, and shall run from the date of delivery of the corrected or replaced supplies.

(8) If the Government returns supplies to the Contractor for correction or replacement under this clause, the Contractor shall be liable for transportation charges up to an amount equal to the costs of transportation by the usual commercial method of shipment from the place of delivery specified in this contract (irrespective of the f.o.b. point or the point of acceptance) to the contractor's plant and return to the place of delivery specified in this contract. The Contractor shall also bear responsibility for the supplies while in transit.

(e) Remedies Available to the Government;

(1) The rights and remedies of the Government provided in this clause--

(i) Shall not be affected in any way by any terms or conditions of this contract, concerning the conclusiveness of inspection and acceptance;

(ii) Are in addition to, and do not limit, any rights afforded to the Government by any other clause of this contract, and

(iii) Shall survive final payment.

(2) Within NOTE 3 after receipt of the contractor's recommendations for corrective action and adequate supporting information, the Contracting Officer, using sole discretion, shall give the Contractor written notice not to correct any defect, or to correct or partially correct any defect within a reasonable time at (Cont Off. insert location(s).)

(3) In no event shall the Government be responsible for any extension or delays in the scheduled deliveries or periods of performance under this contract as a result of the Contractor's obligations to correct defects, nor shall there be any adjustment of the delivery schedule or period of performance as a result of the correction of defects unless provided by a supplemental agreement with adequate consideration.

(4) This clause shall not be construed as obligating the Government to increase the contract price.

(5) The Contracting Officer shall give the contractor a written notice as required in paragraph (e)(5)(ii) below, specifying any failure or refusal of the contractor to--

(i)

(A) Present a detailed recommendation for corrective action as required by paragraph (d)(3) of this clause;

(B) Correct defects as directed under paragraph (d)(4) of this clause; or

(C) Prepare and furnish data and reports as required by paragraph (d)(5) of this clause.

(ii) The notice shall specify a period of time following receipt of the notice by the contractor in which the contractor must remedy the failure or refusal specified in the notice.

(6) If the Contractor does not promptly comply with the Contracting Officer's written notice in paragraph (e)(5)(i) of this clause or if the Contracting Officer elects not to require the Contractor to take full corrective action under (e)(2) above, the Contracting Officer may by contract or otherwise --

(i) Correct the supplies or services; or

(ii) Replace the supplies or services; and if the Contractor fails to furnish timely disposition instructions, the Contracting Officer may dispose of the nonconforming supplies for the Contractor's account in a reasonable manner, in which case the Government is entitled to reimbursement from the contractor, or from the proceeds, for the reasonable expenses of care and disposition, as well as for excess costs incurred or to be incurred;

(iii) Obtain applicable data and reports; and

(iv) Charge the contractor for the costs reasonably incurred by the Government.

(7) The contractor shall be liable for the reasonable costs of disassembly and/or reassembly of larger items when it is necessary to remove the supplies to be inspected and/or returned for correction or replacement.

(8) If the Government performs all or any portion of any correction, the Government shall receive a credit for its work. If the total of the prices of supplies - (other than/including) provisioned items - remaining to be delivered under this contract is greater than the credit due the Government, such prices shall be reduced by the amount of the credit. If the credit is larger than such total, the contractor will pay the amount of the credit to the U.S. Treasury. The credit will be computed as follows:

(a) For repair or parts replacement.

A part credit for each part that the Government replaces which shall be the most recent contractually agreed to price for a like part existing at the time the part is replaced; provided, however, that if a price for such part has not been contractually agreed to within a twelve (12) month period prior to the time the part is corrected or replaced, then the ACO and the contractor shall promptly establish a price for such part, plus,

(b) For labor expended by Government personnel.

A labor credit which shall be the fully burdened hourly wage rate at the Government Repair Facility, as that rate is identified in the then current Budget, times the number of standard labor hours for making the correction. The labor hours will include those for disassembly, repair, parts replacement, reassembly, inspection, and test required to remedy the defect; and will be determined by the hours expended by Air Force personnel to perform the above tasks during the maintainability demonstration.

(c) For other corrections, the credit will be as determined by the PCO and shall be equitable and representative of the actual cost to the Government.

(d) Any replacement or redesigned parts required to be provided by the contractor to correct any defect shall be provided within 45 days after direction by the PCO. Any incorporation of redesigned parts shall be completed by the contractor within 90 days after delivery of a NOTE 1 to the contractor's plant with PCO direction to incorporate. If the contractor fails to meet any such requirement, liquidated damages are hereby established as follows:

(i) For each NOTE 1 \$NOTE 3 per calendar day but not to exceed \$NOTE 3.

(ii) For each part or component of NOTE 1, \$NOTE 3 per calendar day but not to exceed \$NOTE 3.

(f) Exclusions.

The contractor shall not be responsible under this clause for the correction of defects in Government-furnished property, except for defects in installation, unless the contractor performs, or is obligated to perform, any modifications or other work on such property. In that event, the contractor shall be responsible for correction of defects that result from the modifications or other work.

(1) The Government will service each NOTE 1 in accordance with the prescribed maintenance manuals, and maintain operational and maintenance records.

(2) This clause shall not apply to a NOTE 1 suffering damage caused solely by:

(a) Improper or negligent installation, operation, or maintenance by Government personnel;

(b) Foreign object damage; or

(c) Combat damage.

If the parties disagree as to whether damage arose solely from any of these causes, the contractor shall have the burden of proving that the NOTE 1 was damaged by that cause.

(g) Limitations.

All implied warranties of merchantability and "fitness for a particular purpose" are excluded from any obligation under this contract.

(1) The warranty and guarantee provisions of this clause do not cover liability for loss, damage, or injury to third parties, nor do they cover consequential damages.

(2) The following is the only circumstance which is not covered by these warranties and guarantees;

Except as otherwise specified in this contract, combat damage, but only to the extent the defect in question is proximately caused by such combat damage.

(h) Price of Warranties and Guarantees (see NOTE 4)

It is agreed that, with respect to the following line items, the amounts indicated represent the portion of the contract price attributable to warranties and guarantees under this clause:

<u>Item Line</u>	<u>Total Price of</u> <u>All Warranties/</u> <u>Guarantees Under</u> <u>This Clause</u>	<u>Portion</u> <u>Attributable</u> <u>To</u> <u>Performance</u> <u>Guarantee</u>	<u>Portion</u> <u>Attributable</u> <u>To</u> <u>Materials/</u> <u>Workmanship</u> <u>Guarantee</u>
.....	\$ _____	\$ _____	\$ _____
.....	\$ _____	\$ _____	\$ _____

	<u>Portion</u> <u>Attributable</u> <u>to Essential</u> <u>Performance</u> <u>Warranty</u>	<u>Portion</u> <u>Attributable</u> <u>to Other</u> <u>Performance</u> <u>Warranty</u>	<u>Portion</u> <u>Attributable</u> <u>to Reliability</u> <u>Warranty</u>
.....	\$ _____	\$ _____	\$ _____
.....	\$ _____	\$ _____	\$ _____

	<u>Portion</u> <u>Attributable to</u> <u>Maintainability</u> <u>Warranty</u>	<u>Portion</u> <u>Attributable</u> <u>to Passthrough</u> <u>Warranties</u>
.....	\$ _____	\$ _____

(j) Government Unlimited Rights in Data.

In recognition of the Government's substantial participation in the cost of effecting correction to defects (paragraphs c-1, c-2, and c-3 of this clause); the parties agreed that no item, component, or process generated by redesign conducted under this clause will be deemed to have been developed at private expense and, as a result, the Government will have unlimited rights in all the revised portions of the technical data that is delivered in carrying out this clause.

(k) Resolution of Conflicts in Warranty Requirements.

In the event a requirement under the Design/Manufacturing Conformance Warranty conflicts with a warranted performance requirement, the Contractor shall promptly inform the contracting Officer of such conflict and, at no increase in contract price, provide the Contracting Officer with any design/manufacturing or other changes necessary to ensure compliance with warranted performance requirements. The reliability and maintainability requirements shall be considered performance requirements under this clause. Upon Contracting Officer approval of such proposed changes, they shall, unless otherwise directed by the Contracting Officer, be implemented, at no increase in contract price, for all affected supplies or services purchased under this contract.

(l) Access to Maintenance and Operational Facilities.

1. The contractor shall be notified of and, at it's

election, may witness at the repair facility, the disassembly or inspection of any NOTE 1 containing, or suspected of containing, a breach of the guarantees in 2c-1, 2c-2, or 2c-3.

2. During the period of this guarantee, and in support thereof, the contractor shall have reasonable access to existing Government records relating to operation, inspection, and maintenance of the NOTE 1(s) at the place where such records are customarily maintained, and shall be entitled to utilize and make copies, at it's expense, of said records. The contractor may also, from time to time, review pertinent maintenance and operational facilities.

(m) Cost Tracking.

The contractor shall maintain, in a separate cost account, all costs which are associated with this clause. Such costs shall be segregated from any and all other costs associated with end item deliverables, tooling, provisioned items, or any other work, as well as from any costs associated with other contracts.

(n) Marking and Numbering.

All NOTE 1 systems delivered under this contract will have "WARRANTED" permanently and clearly imprinted on the delivered item (IAW MIL STD 129) and it's container (IAW MIL STD 130)(DI-_____). The period of coverage or the expiration date will also be shown on the markings. The period/circumstances or Guarantee coverage shall be recorded in any maintenance records for all NOTE 1(s) delivered under this contract. Date of acceptance of the NOTE 1 shall also be entered into the records. All warranted NOTE 1 systems, and when possible, all warranted parts shall be marked with a warranty symbol to assure identification.

- NOTE 1 Name of system/equipment for which the stated warranty/guarantee will be applied.
- NOTE 2 Acronym of the system/equipment. (Unit may be used if defined by a table or reference in Part I).
- NOTE 3 Information to be established by the program office, i.e., time, values, references, etc.
- NOTE 4 This paragraph may be used when the warranty/guarantee is not a separately priced line item.
- NOTE 5 The designated place(s) of repair/replace action under this clause.
- NOTE 6 Information to be established by the contractor within the limits established by the program office. i.e., time, values, references, etc.

SAMPLE #3

MODEL ENGINE WARRANTY

(A) Definitions: The definitions in MIL-STD-280A, Far 1-201, and Far 14-001 apply in addition to the following:

1. Warranty: The promise given by the Contractor to the Government regarding the performance of services and the nature, usefulness, and condition of engines and items furnished under the _____ (enter contract number) engine contract.

2. Acceptance: The execution of the Acceptance Block and signing of a DD Form 250 by the authorized Government representative.

3. Allowances: The allowances in connection with this Warranty are:

a. Repair Allowances: A Credit to be granted to the Government by the Contractor for allowances in accordance with the attached "Schedule of Allowances; Labor and Materials."

b. Materials Allowance: An allowance based on an average value for expendables and other items used for repair.

4. Campaign Change: A retrofit program initiated by the engine Contractor to modify, substitute or replace an item or items in a group of engines.

5. Corrective Maintenance: Maintenance performed to restore an item to a satisfactory condition by providing correction of a malfunction which has caused degradation of the item below the specified performance.

6. Defect: Any deviation of a unit of product from specific requirements. A unit of product may contain more than one defect.

7. Direct Damage: The damage suffered by an engine or item, itself, upon its failure.

8. Engine: The complete production configuration _____ (enter Engine Designation) engine assembly as accepted by the Government under this contract.

9. Engine Cycle (EC): An engine throttle transient (event) characterized by a zero power (OFF) to Intermediate Rated Power (IRP; maximum non-augmented and above) to zero power (OFF) excursion with the engine operating. It is a "major cycle" when discussing thermal and fatigue life.

10. Engine Flight hours: The hours obtained from measurements or records available from the _____ (enter Nomenclature of Engine Monitoring System) or as calculated per AFR 60-1, Attachment 2. paragraph 5.r.

11. Expendable Items: Those items which must be replaced during inspection, repair, or maintenance, whether or not such items have been damaged.

12. Failure: Any engine or item which suffers premature deterioration as described in C.4, is unserviceable in accordance with procedures specified in the approved Technical and Maintenance Manuals, is not in conformance with the purchase description as set forth in Section "B" of this contract, or has any defect in design, material, or workmanship shall be considered a failure under this Warranty, except those failures which are covered under Exclusions, in paragraph D.

13. Foreign Object Damage: Damage to an engine or item resulting from the ingestion of material not resident within the engine.

14. Hot-Gas Flowpath Items: All items in contact with the engine hot gas flow: (Contractor List Those Items to be included in the Hot-Gas Flowpath, e.g., the inner and outer combustion liners, the rotating and stationary turbine air foils).

15. Item: Any portion of an engine below the engine assembly itself as defined in A.8 above.

16. Logistically and Operationally Supportable: The necessary items must be available at the proper time to prevent adverse impact on aircraft availability; the Government is not required to remove aircraft from operational flying status to incorporate a fix.

17. Low Cycle Fatigue (LCF) Cracking: any crack or rupture to an engine part directly caused by LCF.

18. Mission Cycle: For purposed of this Warranty a mission cycle is: $\text{Mission Cycle} = \text{EC} + 1/x (\text{TTIC} - \text{EC})$ where EC is the engine cycle herein defined, and TTIC is the number of engine excursions/cycles and time at temperature taken from the engine monitoring system.

19. Module: A major engine subassembly which is traceable for management and maintenance purposes and is interchangeable with other like subassemblies. Modules under this Warranty include those which are incorporated into the engine specification by Specification Change Notice (SCN) action and; _____ (Contractor list Engine Modules).

20. Repair: To restore an engine or item to serviceable condition.

21. Repairable: Refers to an engine or item that can be returned to serviceable condition by a designated repair facility at a cost less than or equal to 75% of the acquisition cost.

22. Secondary Damage: The damage suffered by an item because of a failure of another item within the same engine.

23. Serviceable: An engine or item in new or used condition suitable for issue and use as originally intended. The engine or item must be capable of meeting the requirements and performing the function for which designed, and meet all test requirements established by the engine model specification.

24. Subcontractor or Vendor Warranties: Those warranties which may be obtained by the prime engine manufacturer from subcontractors or vendors.

25. Technical and Maintenance Manuals: Those Technical and Maintenance Manuals provided by the Contractor and accepted by the Government for maintenance and operation of the (enter Engine designation) engine. (Contractor list the documents by number and title.)

26. Turn Around Time (TAT): The length of time permitted for Contractor repair or replacement and presentation for return (with subsequent acceptance) of Government assets, counted from the date of the engine or item arrival at the Contractor's designated plant or depot repair facility shipping dock.

(B) Warranty

The Contractor warrants that at the time of acceptance, each of the production engines accepted under this contract will be free from defects in design, material and workmanship and will conform with the Section "B" purchase description of this contract. However, with respect to any Government Furnished Property, the contractor's warranty shall extend only to proper installation, unless the contractor performs some integration, modification, or other work on such property, in which case the contractor's warranty shall extend to the integration, modification, or other work. The Contractor warrants all items and services provided by the Contractor, or under the Contractor's Source Control, shall be free from defects as described above. The period for discovery of defects extends to the same limits as those specified in paragraph C below.

(C) The Contractor Further Warrants That:

1. Each production engine will be serviceable in

accordance with the procedures specified in the approved Technical and Maintenance Manuals for (TBD) Engine Flight Hours (EFH) or (TBD) years from the date of Government acceptance, whichever occurs first.

2. The Hot-Gas Flowpath items excluding turbine disks, shall remain serviceable without corrective maintenance for (TBD) Engine Flight Hours (EFH), (TBD) Engine Cycles, or TBD years from the date of Government acceptance, whichever occurs first.

3. All items listed in Section J of this Warranty shall have a minimum life without items (s) replacement and without item (c) repair and shall not exhibit LCF cracking or rupture, for (TBD) Mission Cycles, or (TBD) years from the date of Government acceptance, whichever occurs first.

4. Engine thrust/shaft horsepower shall not deteriorate to a level below 95% of the minimum specification requirement for new engines at any time within the warranty time/cycle limits stated in C.2, above, when maintained in accordance with approved Technical and Maintenance Manual procedures. If engine refurbishment is required, the Contractor shall restore engine thrust/shaft horsepower to at least 97% of the insert model specification level and applicable table).

5. Items provided by or under the Source Control of the Contractor, whether on this or another contract, shall be covered by this Warranty when installed in a warranted engine.

6. If the operation and support of the engine fail to meet any condition of this warranty, the Contractor shall investigate and define the primary elements contributing to nonconformance. The contractor shall develop and provide, at no cost to the Government, remedies to rectify such nonconformance. Government acceptance is required prior to implementation of any remedy. If such remedy requires the Contractor to engage in any redesign efforts the Contractor shall conduct this effort and provide the necessary modification/retrofit hardware up to a liability cap of \$(TBD) Million.

7. This warranty covers both direct and secondary damage.

(D) Warranty Exclusions; The Contractor's obligations under this warranty do not include engines or items rendered unserviceable by:

1. Improper or negligent installation, operation, or maintenance by the Government unless such actions were the result of Contractor activity;

2. Foreign Object Damage;

3. Damage as a direct result of armed conflict;

4. Damage from aircraft accident, other than that caused by engine failure; or,

5. Damage resulting from Acts of God or the Public Enemy.

(E) Remedies:

1. For a failure under this warranty, the remedy is:

(a) The contractor shall repair or replace any engine or items; and,

(b) The contractor shall provide credits to the Government for all allowances due the Government for actions performed in lieu of requiring the remedy in E.(1)(a), above, and for any disassembly, reassembly and test in connection with the removal/replacement of a failed or defective item.

2. When the Government returns a warranted engine or item to the Contractor, the Contractor shall complete repair or replacement and tender such repaired or replaced engine or item for delivery to the Government within the following turn around items (TAT):

(a) (TBD) calendar days for engines

(b) 30 calendar for days items, except

(c) 10 calendar days for any engine or item rejected by the Weapon System Contractor during the engine installation/checkout process.

3. Calendar days shall be calculated from the date of arrival of the engine or item at the contractor's designed plant or depot repair.

STORAGE VERIFICATION GUARANTEE

A. Introduction. The Storage Verification Guarantee (SVG) objective is to ensure the design and production of NOTE 1 with high storage reliability. Based on the results of the Storage Verification Program (SVP) test conducted in accordance with paragraph _____ of the Production SOW (CLIN _____), the Contractor may earn an incentive fee hereunder by exceeding the minimum Acceptable Storage Reliability (R_{MA}). Conversely, if R_{MA} is not achieved, the contractor is required to submit SVG-ECPs at no additional cost to the Government and to retrofit the inventory at cost (no additional fee/profit). In addition, if a storage reliability (R_S) of NOTE 2 is not achieved and option Alternative B or C (sub CLIN _____) has been exercised, the contractor will incur the retrofit liability described therein. Figure 1 under this Section H-__ provides a graphic description of this guarantee provision.

B. This is a firm fixed price requirement. The contractor's cost of performance under this clause shall not be included under any cost incentive pricing provision of this contract nor in the price of any subsequent contract except to the extent to which reimbursement costs are expressly contemplated hereunder.

C. Incentive. Eligibility for payment of this incentive is based on the results of the one-shot tests and the computation of storage reliability as defined herein. If two or more one-shots of a particular type fail, no incentive will be paid regardless of the storage reliability value computed. Any incentive earned shall be computed by the PCO in accordance with Table 1 under this Section H-__ within __ calendar days after approval of the final test results up to a maximum fee of \$_____.

D. Guarantee. Notwithstanding Government inspection and acceptance of supplies and services furnished under this contract or any provision of the contract concerning the conclusiveness thereof, the contractor shall, for the price of CLIN _____, perform the effort called for in the applicable alternative below.

(1) Guarantee Alternatives:

(a) Alternative A (CLIN _____ A): In the event the contractor fails to achieve a storage reliability R_{MA} of NOTE3 or above, the Contractor shall within __ calendar days of the PCO's approval of the SVP test report, propose SVG-ECPs to implement correction of the identified pattern failure mode(s) (i.e., two or more failures have same failure mode as determined

by the PCO). Additionally, the PCO shall have the authority to require submission of SVG-ECPs on the basis of non-pattern failures. The SVG-ECP shall include the following tasks:

1. Preparing and validating the SVG-ECPs.

2. Updating the product baseline including applicable NOTE 1 technical data, and

3. Upon Government direction, incorporating the SVG-ECPs at cost (no additional fee/profit), except to the extent that Alternative B or C may increase the contractor's liability, in all leader and follower:

- a. missile delivered
- b. spare or repair parts
- c. support equipment (SE)
- d. software
- e. containers, and
- f. any other data or supplies necessitated by incorporation of the proposed SVG-ECP, to the extent that such items were originally acquired from the leader and/or follower as part of the NOTE 1 system, including its support system.

4. Upon Government direction, incorporate in all leader missiles contracted for at the time the tests under CLIN _____ begin (including priced options then or thereafter exercised), but not yet delivered to the USAF, the SVG-ECPs, at cost (no additional fee/profit) (except to the extent that Alternative B or C may reduce the Government's reliability for reimbursement of costs).

5. In the event the contractor fails to achieve a storage reliability of R_{MR} ($R_{MR} = \underline{\hspace{1cm}}$) or above, the contractor shall as a minimum accomplish the requirements of d.(1)(a) with no additional liability under this provision due to failure to achieve R_{MR} .

6. All costs associated with paragraph d.(1)(a) except for d.(1)(a)3 are considered to be included in the firm fixed price of CLIN _____. Such costs shall be excluded from consideration under any other special pricing provisions of this contract and/or the price of any subsequent NOTE 1 contract.

(b) Alternative B.

1 In the event the Contractor fails to achieve a storage reliability R_{MA} of ____ or above, the Contractor

shall as a minimum accomplish the requirements of Alternative A, and, in addition, if the storage reliability achieved is less than _____, the SVG-ECP shall be incorporated in 500 missiles and their containers, as appropriate, at no cost to the Government.

2 In the event the contractor fails to achieve a storage reliability of R_{MR} ($R_{MR} = \underline{\hspace{1cm}}$) or above, the contractor shall as a minimum accomplish the requirements of paragraph d.(1)(a) above except that the SVG-ECP shall be incorporated in 500 leader missiles and/or the corresponding number of containers at no additional cost to the Government.

3 All costs associated with paragraph d.(1)(a) except for d.(1)(a) are considered to be included in the firm fixed price of CLIN _____. Such costs shall be excluded from consideration under any other special pricing provisions of this contract and/or the price of any subsequent NOTE 1 contract.

(c) Alternative C.

1 In the event the Contractor fails to achieve a storage reliability R_{MA} of _____ or above, the Contractor shall as a minimum accomplish the requirements of Alternative A, and, in addition, if the storage reliability achieved is less than _____, the SVG-ECP shall be incorporated in 1,000 missiles and their containers, as appropriate, at no cost to the Government.

2 In the event the Contractor fails to achieve a storage reliability of R_{MR} ($R_{MR} = \underline{\hspace{1cm}}$) or above, the Contractor shall as a minimum accomplish the requirements of paragraph d.(1)(a) above except that the SVG-ECP shall be incorporated in 1,000 leader missiles and/or the corresponding number of containers at no additional cost to the Government.

3 All costs associated with paragraph d.(1)(a) except for d.(1)(a)3 are considered to be included in the firm fixed price of CLIN _____. Such costs shall be excluded from consideration under any other special pricing provisions of this contract and/or the price of any subsequent NOTE 1 contract.

(2) Transportation costs to and from Contractor's facility for hardware subject to retrofit will be at Government expense.

(3) NOTE 1-SVG-ECPs shall not be subject to the provisions of the "Value Engineering clause."

(4) All ECPs submitted pursuant to this provision shall be identified as "NOTE 1-SVG-ECPs."

(5) The Government agrees that all SVG-ECPs submitted hereunder to improve the storage reliability of the NOTE 1 will receive special expeditious processing. Notwithstanding the

special processing, any such SVG-ECP shall be automatically incorporated in the contract by the Government calendar days after receipt by the PCO unless the contractor has received written notification of its nonapproval from the Government prior to that date.

(6) The Contractor shall have calendar days after receipt of the PCO's notice of nonapproval of an SVG-ECP to submit a revised, amended or new SVG-ECP providing for correction of the NOTE 1 system failure. If the parties fail to agree upon the incorporation of the new or revised SVG-ECP, then the PCO may direct the correction to be taken by the Contractor, and the Contractor shall comply with such direction, and the matter shall be resolved pursuant to the provisions of the "disputes" clause of this contract.

(7) Retrofit of inventory assets shall commence NLT calendar days after Government SVG-ECP retrofit approval and shall be completed expeditiously

E. Computation of Reliability

(1) $R_{MR} = \underline{\hspace{2cm}}$

(2) The exposed storage reliability shall be computed based on the results of the SVP test in accordance with the following:

$$R_S = \frac{ETP}{LT} \times \frac{OTP}{OT}$$

Where

R_S = storage reliability

ETF = total number of SVP missile tests with no chargeable relevant failures.

ET = total number of relevant SVP missile tests

QTF = total number of SVP one-shot tests with no chargeable relevant failures

OT = total number of relevant SVP one-shot tests.

(3) Failures shall be defined and categorized in accordance with the system specification, paragraphs 3.1.4, 3.1.5 and 5.6 of MIL-STD-781C, and Figure 1 of this provision. The PCO shall be the final authority in classification of failures and determination of test relevancy.

(4) If due to operational requirements the quantity of missiles in the SVP test is less than __, the SVG shall be terminated.

Value of R_s based on the results of the SVP test			Proportion of Maximum Available Incentive Earned
R_s	R_{ma}		0
R_{ma}	R_s	R_g	$\frac{R_s - R_{ma}}{R_g - R_{ma}}$
R_s	R_g		1.00

Where R_s = Storage Reliability
 R_{ma} = Minimum acceptable storage reliability
 R_g = Storage reliability requirement

NOTE: No incentive will be paid if two or more one-shots of a particular type fail to pass their prescribed test. One-shots subject to the SVG are all components which cannot be functionally tested without destruction. (includes warhead safe and arm devices, but excludes warheads)

Table 1. SVG Incentive Earned

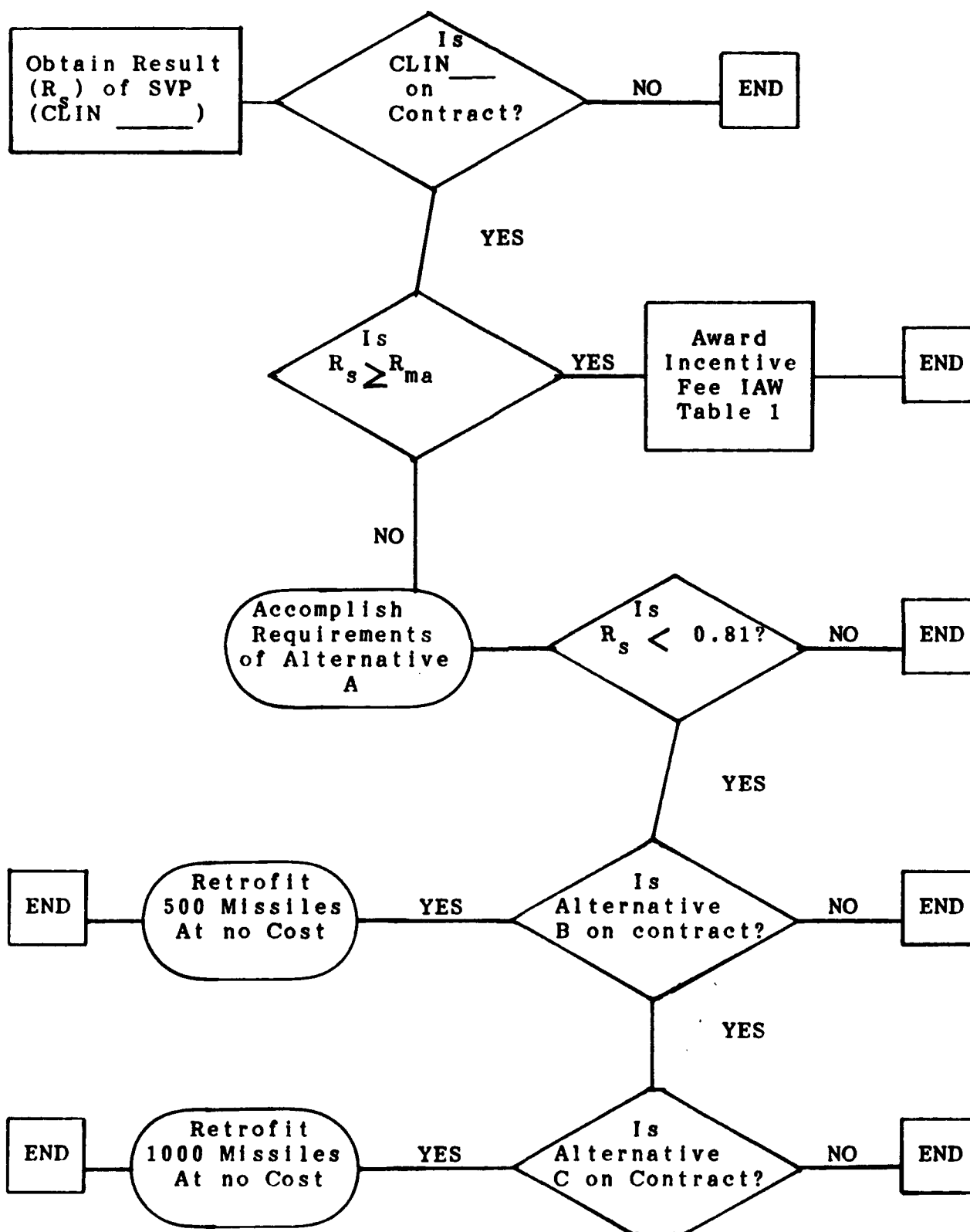


Figure 1, SVG Description

PAYMENT FOR EXERCISE OF STORAGE VERIFICATION GUARANTEE (SVG) -

Payment for CLIN _____ shall be made upon actual commencement of testing under CLIN _____.

PROVIDING TECHNICAL SERVICES
(CLIN _____ A, _____ B, and _____ C)

A. The contractor will provide technical services upon receipt of written direction from the Contracting Officer. Services will be performed at the location and period specified by the Contracting Officer and in accordance with Section _____ of this contract. Performance is limited to those locations identified in paragraph c below. The contractor will be provided notification for services at least _____ hours prior to the time the Technical Services at the specified location are to commence.

B. Travel time will be considered as service for payment purposes.

PAYMENT FOR TECHNICAL SERVICES
(CLIN _____ A, _____ B, and _____ C)

A. The contractor will be paid the rate specified in Section B for each man-month of performance.

B. No payment will be made for man-months of services or travel unless actually performed and verified on the Certificate of Services submitted pursuant to the Contract Data Requirements List, AFSC Form 708.

C. A man-month consists of twenty-one (21) eight-hour days (in units or parts) of effort by one (1) or more persons.

DATA

A letter of transmittal for each data submittal will be forwarded to AD/YM, Attn: DMO. Each submittal shall contain as a minimum the contract number and the Contract Data Requirements List sequence number. A copy of the letter of transmittal shall be forwarded to the ACO and PCO at time of distribution.

SUBMISSION OF RESET PROPOSAL (OPTION A) CLIN _____

The contractor shall submit a firm proposal in accordance with FAR clause _____ of the General Provisions, entitled "Incentive Price Revision (Successive Targets) (1980) FEB)." Failure to submit said proposal in a form acceptable to the Government and within the time stated, herein, could be cause for the Government to cease further payment hereunder. Submission of the reset proposal shall be required _____ days prior to the scheduled time for exercise of the option.

- NOTE #1 - Name of system/equipment for which the SVG will be applied.
- NOTE #2 - Acronym of the system/equipment. (Unit may be used if defined by a table or reference in Part 1).
- NOTE #3 - Values to be established by program office, i.e., percentages, days, hours, etc.
- NOTE #4 - References to be identified by program office, i.e., SOW, CDRL, etc.
- NOTE #5 - If support equipment is included in the purchase, it should be included in the warranty and in the remedies if it does not operate properly and/or if it is not delivered on schedule.

SAMPLE #5
RELIABILITY IMPROVEMENT WARRANTY (RIW)

PART I - INTRODUCTION

1.0 General

1.1 The purpose of this introduction is to provide an overview of the specific requirements contained in Parts 2 through 6, which outlines the extent and period of the RIW as well as the liabilities and obligations of both the contractor and Government.

1.2 The RIW requirements described herein are to induce the contractor to design reliability and maintainability (R&M) into the product. Furthermore, the RIW extends the contractor's responsibility for a period of time beyond delivery of the product thus motivating the contractor to further improve R&M, at no additional cost to the Government above the negotiated fixed price of the RIW, CLIN (NOTE #4).

1.3 Maximum latitude shall be given the contractor to make no cost changes to improve R&M however, Government approval is required for all Class I engineering changes.

1.4 Under the provisions defined herein, the contractor will be required to correct or replace, at his expense, any (NOTE #4) which fails during the warranty period.

1.5 The RIW is for a (NOTE #3) year period. The period shall commence (NOTE #3) days after Government final acceptance of the first production (NOTE #2) (without deviation or waiver) or the operational installation of the (NOTE #2), whichever occurs first. Operational installation shall be either Government acceptance of a production system wherein the (NOTE #2) was provided to the system contractor as Government Furnished Equipment (GFE), or the successful installation of the (NOTE #2) in modification of an existing system (normally kit-proofing).

1.6 The warranty period may be extended for additional one (1) year periods. The Procuring Contracting Officer (PCO) and the contractor agree to negotiate in good faith the price for any extension of the warranty period. Notification of the Government's intent to negotiate a warranty period extension shall be provided to the contractor eighteen (18) months prior to the expiration of the warranty period in force. Negotiations shall commence no later than six (6) months after such notification. The Terms and conditions of this provision shall apply to such extended periods.

1.7 The contractor is required to loan spare (NOTE #2) to the Government and specified intervals if the contractor's actual turnaround time (TAT) is greater than guaranteed or if the

achieved mean-time-between-failure (MTBF) is less than the guarantee MTBF.

1.8 The Government will manage the (NOTE #2) spares inventory. Based upon spares inventory procedures, which considers the contractor's guaranteed MTBF and TAT, the Government shall purchase and place in inventory at various base locations and the secure storage area at the contractor's facility, a quantity of (NOTE #2) spares which is consistent with the schedule of installs. When a requirement for a (NOTE #2) spare is generated from the field, the contractor will be notified by Material Release Order (MRO), and will promptly provide a replacement from the secure storage area. The contractor's obligations as described herein are not affected by the quantity of spares unilaterally positioned at any location by the Government.

1.9 At the conclusion of the warranty period, the contractor is required to provide modification kits and appropriate installation instructions, at no increase in contract price for all (NOTE #2) not of the latest approved RIW configuration.

1.10 Pending determination that the contractor is successfully satisfying the requirements of this RIW, the Government may withhold up to (NOTE #3) percent of CLIN (NOTE #4). (NOTE #5)

PART 2 - Statement of Contractor Warranty

2.1 Notwithstanding Government inspection and acceptance of supplies and services furnished under this contract or any provision of this contract concerning the conclusiveness thereof, the contractor guarantees that all (NOTE #2) furnished under this contract shall be free from effects in design, material, and workmanship and shall operate in their intended environment in accordance with specifications, drawings, and approved technical orders for the warranty period set forth herein. This warranty shall apply to all (NOTE #3) furnished under this contract, including all option quantities procured, and all associated spares whether procured by the Government or on loan from the contractor.

2.2 Any (NOTE #2) which fails shall be returned to the contractor's designed repair facility at Government expense. Such returns shall be either corrected or replaced at contractor's expense, so as to operation in accordance with (NOTE #4). Returned (NOTE #2) as corrected or replaced and accepted by the Government in accordance with approved repair verification test procedures shall be placed in secure storage, packaged and ready for issue. (NOTE #2) shipped for correction on or before the expiration date of the warranty shall be covered under the terms of the warranty.

2.3 Exclusions

2.3.1 The contractor shall not be obligated to correct or replace any NOTE #2) under the provisions of this warranty if loss or damage occurs by reason of (i) non-(NOTE #2) induced fire, explosion, aircraft crash; (ii) submersion; (iii) acts of God such as flood, hurricane, tornado, and earthquake; and (iv) combat action.

2.3.2 The contractor shall be obligated under these warranty provisions for (i) repair of damage to warranted (NOTE #2) caused by unauthorized maintenance by Government personnel (authorized maintenance is defined in Part 4); (ii) repair of external physical damage caused by accidental or willful mistreatment by non-contractor personnel; or (iii) repair of internal damage which, in the determination of the Administrative Contracting Officer (ACO), was caused by accompanying external damage.

2.3.3 The conditions specified in paragraph 2.3.1 and 2.3.2, except for natural disasters, apply only to loss or damage occurring on locations other than those owned or controlled by the contractor or occurring while the (NOTE #2) is not under contractor's possession or custody. Under paragraph 2.3.2 only the repair of damage shall be the responsibility of the Government. All other expenses to receive, process and store a returned (NOTE #2) shall be the responsibility of the contractor as a part of his warranty obligations, unless there is clear and convincing evidence that the unit was returned solely because of the exclusion condition.

2.3.4 Specific cases wherein the contractor and the ACO cannot agree on warranty coverage shall be referred to the PCO for final disposition. PCO dispositions which are to be agreed to by the Contractor shall be subject to the "Disputes" clause of the contract.

2.3.5 Specific cases wherein the ACO determines that the NOTE #2 is not covered within the terms of the warranty and is not correctable, the equipment shall be disposed of, in accordance with this paragraph, or declared lost, may be replaced by the Government with new (NOTE #2) pursuant to the clause entitled "Option for Increase Quantities." Equipment so replaced shall continue to be warranted until the end of the RIW.

2.4 In no event shall the contractor be liable for special, consequential or incidental damages and nothing within the terms, conditions and requirements of this RIW provision shall be construed as being, or amounting to, special, consequential or incidental damages.

2.5 For purposes of this RIW, a failure is defined as any warranted NOTE #2 returned to the contractor because of a failure indication, a malfunction and/or a reduction in the performance

of the (NOTE #2) below requirements of the contract specification.

PART 3 - Contractor Obligations

3.1 In meeting the warranty provisions specified in Part 2 above, the contractor shall comply with the following provisions:

3.1.1 The contractor shall maintain the records required herein, by serial number for each (NOTE #2) under warranty. Such records shall be made available to the Government as required and shall be available for review during the warranty period and for (NOTE #3) thereafter.

3.1.2 The contractor shall provide and install seals for all warranted (NOTE #2) to discourage unauthorized maintenance. The design of the seals shall be such that inadvertent seal breakage is minimized. Seal material and placement on the (NOTE #2) must be approved by the PCO. A broken seal in and of itself shall not void the warranty. An exclusion exists only when the cognizant ACO determines that damage occurred due to unauthorized maintenance (reference paragraph 2.3.2).

3.1.3 The contractor shall place on each (NOTE #2) in addition to the identification plate; (i) a display which will provide, but not be limited to, information that the (NOTE #2) is under warranty, the warranty expiration date, failure data requirements and shipping instructions; and (ii) a decal for field personnel to record the date of installation and the date of removal. The proposed format(s) application and proposed location(s) of the display and decal shall be submitted for approval in accordance with CDRL (NOTE #4).

3.1.4 The contractor shall also place warranty information necessary for Government compliance with the terms of the warranty in any Technical Orders (TOs) covering the (NOTE #2). Such information shall include, but not be limited to, instructions on the proper method of recording installation and removal dates and authorized maintenance.

3.1.5 Preservation, packaging, packing, and marking at the contractor's facility shall be in accordance with the packaging and marking section of the contract and be at the contractor's expense. The contractor shall mark the shipping container(s) used for transport of warranted (NOTE #2) with the external citation either "RIW" or "Pacer Warranty."

3.1.6 The contractor shall maintain throughout the warranty period at least one (1) fully operational warranty repair facility. The location of such facility shall be subject to the approval of the PCO, if other than the production facility. The contractor shall provide all necessary facilities,

tooling, and equipment of any type necessary to the successful performance of this warranty.

3.1.7 The contractor shall provide a secure bonded storage area as a depository for serviceable (NOTE #2) covered by this warranty.

3.2 The contractor shall retain responsibility for configuration accounting and performance to contract specification for all (NOTE #2) under warranty.

3.3 Engineering Changes

3.3.1 All contractor developed and initiated changes to improve reliability or maintainability or to reduce repair costs shall be prepared and submitted in accordance with DOD-STD-480. The Government agrees that Class I ECPs submitted by the contractor shall stand as approved by the Government 45 days after receipt by the PCO unless the contractor is notified in writing otherwise.

3.3.2 All RIW ECPs submitted pursuant to this provision shall be identified as "No Cost RIW ECP."

3.3.3 RIW ECOs shall not be subject to the provisions of the value engineering incentive clause.

3.3.4 The contractor's obligations, which shall be accomplished at no increase in contract price, include, but are not limited to:

(i) Engineering effort for and preparation of RIW ECPs; and

(ii) Incorporating RIW ECPs in all warranted (NOTE #2); and

(iii) Changing:

(a) Technical data; and

(b) Spare or repair parts; and

(c) Support Equipment (SE); and

(d) Software; and

(e) Any other data or supplies

necessitated by incorporation of an RIW ECP to the extent that such items were originally furnished by the contractor.

3.3.5 All returned (NOTE #2) shall be updated to the latest approved configuration in accordance with implementation schedules contained in ECPs.

3.3.6 The contractor may, if approved in the implementing ECP, institute field changes to effect modifications.

3.3.7 Within sixty (60) days after the conclusion of the warranty period, the contractor shall, at no increase in contract price provide necessary modification kits and data to permit the Government to modify all (NOTE #2) which have not been updated to the latest approved RIW configuration.

3.4 Both the Government and contractor shall presume that any (NOTE #2) returned to the contractor's repair facility is covered by the warranty. If the contractor considers that correction or replacement is not covered by this warranty provision in accordance with Part 2, Paragraph 2.3, the contractor shall submit the circumstances to the ACO along with a not-to-exceed firm fixed price and schedule for repair. After determination that correction or replacement is not within the terms of this warranty, the ACO may direct the contractor to repair the (NOTE #2) under a separate repair contract established by the NOTE #2) Inventory Manager (IM). (NOTE #2) so repair shall continue to be warranted for the remaining warranty period at no change in contract price.

3.5 The contractor shall provide parts for use in repair and/or modification. These parts remain the property of the contractor until incorporated into a (NOTE #2) at which time title to the incorporated parts passes to the Government. All parts replaced during repair and/or modification become the property of the contractor.

3.6 All (NOTE #2) returned for correction and/or replacement under the provisions hereof shall be subject to repair verification test procedures prepared by the contractor as approved by the PCO, and shall pass such repair verification test procedures prior to placement in secure storage.

3.7 (NOTE #2) returned and covered under this warranty for which a failure cannot be verified and which pass the repair verification test procedures shall be covered by this RIW. These (NOTE #2) shall be updated with approved modifications, pass the repair verification test and after acceptance by the Government shall be packaged, ready for issue and physically placed in secure storage.

3.8 When a demand is generated in the field, the Item Manager shall promptly notify the contractor via the AUTODIN/Contractor Communications Network (CCN) giving shipping instructions for (NOTE #2) to satisfy the requirement via a Material Release Order (MRO). Upon receipt of the MRO, the contractor shall ship a (NOTE #2) from the secure storage area to the activity designated in the MRO. To the extent possible, a first-in/first-out basis shall be used in selecting Note #2) for shipment from the storage area. Such shipments will be made within one (1) working day after receipt of the MRO. The one-day period shall begin at the time of the start of the contractor's normal workday on the day following receipt of the MRO. Only Saturdays, Sundays, and statutory holidays shall be considered

non-working days. In no event shall such shipments be made later than 72 hours after receipt of the MRO. The contractor shall use a Government Bill of Lading accompanied by either a DD Form 1248-1 or DD Form 1349 for transfer of Government property accountability.

3.9 Consistent with the average number of calendar days, specified in Table 1, after receipt by the contractor of a returned warranted (NOTE #2) the contractor shall correct or replace, install approved modifications as necessary, and physically store the item in secure storage. This TAT requirement shall apply to all (NOTE #2) returned except those to which one or more of the exclusions listed in Part 2, paragraph 2.3 apply, and/or Government directed non-RIW ECPs are determined to apply. Turnaround time starts when the (NOTE #2) arrives at the contractor's loading dock and ends when the (NOTE #2) is placed in secure storage, packaged and ready for issue.

TABLE 1

RIW TURNAROUND TIME COMMITMENT

UNIT

TURNAROUND TIME*
(CALENDAR DAYS)

(Contractor supplied number)

*not-to-exceed (NOTE 3) days.

3.10 Calculation of average TAT shall be made each six (6) months of the warrant period. The first such measurement shall cover the first six (6) months of the RIW period. If the average TAT in any six (6) month measurement period, as computed from warranty data records, is greater than the number of days specified in Table 1, the contractor will be required to loan the Government spare (NOTE #2) in accordance with the following formula:

$$n = [AOT (N/G) (Tr-Tm)] - Lp$$

where:

n = Number of turnaround time loaner (NOTE #2) spares to be furnished. (n shall be rounded to next higher whole number when positive; and rounded to the next lower whole number when negative.)

(For the purpose of calculating TAT during the first

measurement period, AOT equals (NOTE #3).) All other measurement periods will use the following formula:)

AOT = Average operating time per day* per (NOTE #2 calculated as follows:

* A day equals 24 hours

$$AOT = \sum H_i / \sum T_i$$

where;

T_i = Number of days each returned (NOTE #2) was installed

H_i = Number of operating hours for each returned (NOTE # 2) during T_i days

N = average number of (NOTE #2) installs calculated as follows:

$$N = \frac{1}{6} \sum_{j=1}^6 \frac{N_j + N_{j-1}}{2}$$

N_j = The number of (NOTE #2) installs on the last day of each month (j) of the six (6) month measurement period.

N_{j-1} = The number of (NOTE #2) installs on the last day of the previous month.

G = Guaranteed MTBF value as specified in Table 2 for the corresponding measurement period. However, (NOTE #3) hours MTBF will be used for measurement period 1 calculations of turnaround time.

TM = Measured TAT. The average number of days each warranty return is in the contractor's possession from time of receipt until it is placed in secure storage as a serviceable unit, packaged and ready for issue.

TR = Turnaround time commitment as specified in Table 1.

Lp = Spare (NOTE #2) currently on loan to the Government through the turnaround time commitment provisions plus any equivalent loaned (NOTE #2) for which payment(s) were made for those loaned (NOTE #2) not provided.

3.10.1 AOT calculations will include data from all (NOTE #2) returned during the measurement period whether or not

an RIW failure. The following provides additional criteria for AOT calculations:

(i) Only operating hours incurred since the last measurement period shall be included. Operating time while the (NOTE #2) is at the contractor's facility shall be excluded. Returned (NOTE #2) on which the elapsed time indicator is inoperable shall be included in the calculation by using the average operating hours per day of other returned (NOTE #2) during the measurement period with available elapsed time.

(ii) Returned (NOTE #2) which have missing installation and/or removal dates shall be considered to have been installed the average number of days of other returned (NOTE #2).

3.10.2 A positive value of "n" represents the liability of the contractor for consignment (NOTE #2) spares under the guaranteed turnaround time provisions of this RIW. However, the actual quantity of such loaner spares shall be no greater than the number of occasions when a (NOTE #2) requested by the IM was not shipped within the required period because of insufficient assets in the contractor's secure storage area. This request will be in the form of a Material Release Order (MRO) or Back/Order (B/O) notification. If n is negative, the provisions of Part 4, paragraph 4.3.2 shall apply.

3.11 Mean Time Between Failures (MTBF) Guarantee. The contractor agrees that (NOTE #2) delivered under this production contract, shall achieve an operational MTBF equal to or greater than the MTBF guarantee value specified in Table 2 for each measurement period.

TABLE 2

<u>MTBF GUARANTEE</u>		
<u>UNIT</u>	<u>GUARANTEED VALUE</u>	<u>MEASUREMENT PERIOD</u>
N/A Contractor Supplied Values		Period 1: 1 thru 6 months
		Period 2: 7 thru 12 months
		Period 3: 12 thru 18 months
		Period 4: 19 thru 24 months
		Period 5: 25 thru 30 months
		Period 6: 31 thru 36 months
		Period 7: 37 thru 42 months
		Period 8: 43 thru 48 months
		Period 9: 49 thru 54 months
		Period 10: 55 thru 60 months
NOTE: The second period value shall not be less than <u>(NOTE #3)</u> .		

3.11.1 The achieved MTBF value (m) is defined as the Total Operating Hours (TOH) during a specified period divided by the total number of failures (F) during the same period. A failure is defined in paragraph 2.5. Removal of a (NOTE #2) solely to accommodate any Government approved ECP shall not constitute a failure. (NOTE #2) which Retest OK (RTOK) as defined in paragraph 3.7, in excess of (NOTE #3) of the total number of failures for any given period, shall be counted as failures for the purposes of achieved MTBF calculations.

3.11.2 Calculations of achieved MTBF shall be made each six (6) months of the warranty period. The first such measurement period shall start at the beginning of the seventh (7th) month of the warranty period. The following explains how such calculations shall be made:

$$M = TOH/F$$

where;

$$M = \text{Achieved MTBF}$$

$$F = \text{Number of (NOTE \#2) failures as defined in paragraph 2.5 and expanded in paragraph 3.11.1, occurring during the measurement period.}$$

$$TOH = \text{Total operating hours during the measurement period calculated as follows:}$$

$$TOH = N \times D \times AOT$$

where;

$$N = \text{Average number of (NOTE \#2) installs as calculated in paragraph 3.10}$$

$$D = \text{Number of calendar days in the measurement period}$$

$$AOT = \text{Average operating time as calculated in paragraph 3.10}$$

3.11.3 In the event the achieved MTBF (M) is less than the guaranteed MTBF (G) stated in Table 11 for that period, the contractor shall furnish to the Government at no increase in contract price the following:

(i) Engineering analysis (including failure analysis) to determine the cause for nonconforming MTBF in accordance with Part VI, Paragraph 6.3.

(ii) Engineering Change(s) pursuant to

DOD-STD-480, based on this analysis.

(iii) Implementation of approved Engineering Change(s) in accordance with paragraph 3.2.

(iv) Additional "pipeline" (NOTE #2) spares to the Government on a loan basis. The quantity of additional (NOTE #2) spares shall not exceed "m" as computed by the formula.

$$m = (A \times S) - Sp$$

where;

m = The maximum number of MTBF pipeline loaned spare (NOTE #2) to be furnished (rounded to the next higher whole number when positive; and rounded to the next lower whole number when negative)

Sp = Spares currently on loan to the Government through the MTBF commitment provisions plus any equivalent loaned (NOTE #2) for which payment(s) were made for loaned (NOTE #2) not provided as required during previous measurement periods.

A = A number calculated by the formula

A = $(G/M) - 1$ (if A is greater than 1, it shall be redefined as 1)

where;

G = (NOTE #2) MTBF Guarantee value as defined in paragraph 3.10 for the corresponding measurement period as specified in Table 2.

M = Achieved MTBF as calculated in paragraph 3.11.2.

S = "Target" spares level calculated by the formulas:

$$S = T + 1.65 \sqrt{T}$$

where;

$$T = N \left(\frac{23 + Tr}{G} \right) \times (AOT)$$

where;

N = Average number of (NOTE #2) installs calculated in paragraph 3.10

- 23 = Number of pipeline days to and from contractor's facility
- Tr = Turnaround time commitment as defined in paragraph 3.10
- G = (NOTE #2) MTBF guarantee value as defined in paragraph 3.10 for the corresponding measurement period as specified in Table 2
- AOT = Average operating time calculated in paragraph 3.10

3.11.4 A positive value of "m" represents the liability of the contractor for consignment NOTE #2 spares under the guaranteed mean-time-between-failure provisions of this RIW. If "m" is negative, the provisions of Part 4, paragraph 4.2.1 shall apply

3.12 The objective of loaned (NOTE #2) is to support the pipeline flow pending improvement of the achieved MTBF and/or TAT. The PCO shall determine the actual number of loaned spares to be provided by the contractor. In no event shall the actual number exceed that computed by paragraphs 3.10 and/or 3.11.3.

3.13 In the event loaned (NOTE #2) are to be supplied by the contractor to the Government as required by paragraphs 3.9 and/or 3.11.3, the contractor shall provide such (NOTE #2) no later than the number of days specified in Table 1B. For each loaner (NOTE #2) not supplied within the appropriate period, the contractor will pay the Government at the rate of (NOTE #3) per day for each date late. In no event, however, shall the payment associated with any measurement period be more than 100 percent of the most recent (NOTE #2) price per (NOTE #2) not supplied within the appropriate period. In addition, L_p in the formula of paragraph 3.10 or S_p in the formula of paragraph 3.11.3 as appropriate, shall be increased by the amount (in terms of the number of (NOTE #2) or fractions thereof represented by the amount of payment) for each (NOTE #2) for which payments were made. The Government shall not refund any dollar (\$) payments that were made by the contractor for late or non-delivery of loaned (NOTE #2).

TABLE 3

<u>DELIVERY SCHEDULE FOR CONSIGNMENT SPARES</u>		
<u>UNIT</u>	<u>IN PRODUCTION**</u> <u>(CALENDAR DAYS)</u>	<u>OUT OF PRODUCTION***</u> <u>(CALENDAR DAYS)</u>
	Contractor Supplied Number	Contractor Supplied Number
** Not-to-exceed <u>(NOTE #3)</u> days from end of measurement period		
*** Not-to-exceed <u>(NOTE #3)</u> days from end of measurement period		

3.14 Loaned (NOTE #2) provided pursuant to either paragraph 3.10 or 3.11.3 which are in the Government inventory shall be subject to all provisions of the RIW at no increase in contract price. The warranty expiration date for such (NOTE #2) shall coincide with the warranty expiration date specified in warranty herein. All (NOTE #2) required at the end of the warranty period, as determined by paragraph 3.11.3 shall become the property of the Government at no increase in contract price.

3.15 Within sixty (60) days after the expiration of the warranty period, the contractor shall notify the PCO in writing of any (NOTE #2) spares of payment due the Government. Based upon PCO approval of the final MTBF calculation, the contractor shall deliver all (NOTE #2) spares due or, with the approval of the PCO, pay the Government 100 percent of the value of any (NOTE #2) spares due. The following value shall be used for each (NOTE #2) spare.

TABLE IV

<u>CONSIGNMENT SPARE VALUE</u>	
<u>UNIT</u>	<u>EQUIVALENT CASH VALUE OF SPARE</u>
	<u>(NOTE #3)</u>

PART 4 - Government Obligations

4.1 The Government shall:

4.1.1 To the extent possible, verify all failures in accordance with applicable technical orders prior to return of the (NOTE #2) to the contractor.

4.1.2 To the extent practical, furnish with each returned (NOTE #2):

(i) (NOTE #2) installation and removal dates

(ii) Failure circumstance information recorded on AFTO FORM 350.

4.1.3 Provide normal upkeep and approved period periodic maintenance (identified by the contractor) using approved organizational and intermediate maintenance technical order procedures.

4.1.4 Notify the contractor when a (NOTE #2) failure occurs, via the AUTODIN/CCN, which will identify the (NOTE #2) serial number, base, and shipping document number.

4.1.5 Assign appropriate transportation priority codes to preclude "batching" of failed (NOTE #2) for return to contractor. Cases where batching of (NOTE #2) is suspected will be submitted to the ACO for determination. If it is determined by the ACO that the Government has batched failed (NOTE #2), the contractor will not be penalized for turnaround time on the batched (NOTE #2).

4.1.6 Provide shipping instructions to the contractor via the AUTODIN/CCN in the form of a Material Release Order (MRO).

4.1.7 Agree that all No Cost RIW Class I ECPs submitted to improve reliability, maintainability or reduce repair cost stand approved 45 days after receipt by the PCO unless the contractor is notified of disapproval in writing prior to that date.

4.1.8 Determine the quantity of loaner spares to be provided in accordance with Part 3, paragraphs 3.10, 3.11.3 and 3.14.

4.1.9 Pay the RIW warranty prices set forth in schedule E of the contract.

4.1.10 Pay for (NOTE #2) transportation costs to and from contractor's designated repair facility.

4.1.11 Provide on a monthly basis the quantity of new (NOTE #2) installs.

4.2 Return of consignment spares.

4.2.1 In the event (NOTE #2) have been loaned to the Government under either the TAT or MTBF commitment and "n" or "m" as calculated in paragraph 3.11.3 hereof is negative during any one measurement period, such calculated quantity of such (NOTE #2) loaned to the Government will be returned to the contractor; except as provided in paragraph 4.2.2 below. In no event shall the number of loaned (NOTE #2) returned to the contractor exceed the actual quantity originally loaned.

4.2.2 (NOTE #2) returned shall be either loaned (NOTE #2) provided by the contractor or equivalent NOTE #2) provided under the production contract.

4.2.3 the Government shall return the number of loaned (NOTE #2) noted in paragraph 4.2.1 above (serviceable) as soon as possible, but not later than sixty (60) days after receipt of the warranty data report that indicates such return is required. Should the Government elect not to return loaned (NOTE #2) (equivalent number - not specific serial numbered (NOTE #2)) the Government may purchase the loaned (NOTE #2) at the most recent (NOTE #2) price. The most recent (NOTE #2) price is defined as the negotiated price of the production (NOTE #2) being fabricated for the Air Force at the time the loaned spares were produced.

4.2.4 A loaner spare returned to the contractor may be used as a production install or spare, but must be refurbished as necessary to produce an item meeting the requirements under which the article was originally manufactured, except as these requirements are modified below, and updated to the latest approved configuration.

(i) All replacement materials and parts shall be specified in the applicable design engineering drawings and/or specifications.

(ii) Minor scratches and chipped paint surfaces shall be touched-up by using matching enamel or lacquer as specified in the Procurement Specification. More severely marked surfaces shall be repainted with matching paint to give adequate protection with a smooth even surface. Marred anodized surfaces will be coated with alodine. Color shade variations in finish due to paint repair are permissible.

(iii) Damaged, illegible, or missing instructions or data plates shall be restored to a legible condition or replaced with new plates.

(iv) Broken, cracked or severely damaged brackets, gussets, etc., shall be reworked to a safe and functional condition or replaced with new parts.

(v) No cleaning of burned, scorched or otherwise discolored surfaces, other than standard cleaning as can be accomplished without causing additional damage, is required

merely for cosmetic reasons to improve appearance.

4.3 The ACO will review the contractor's calculation and supporting data of AOT (reference paragraph 3.10).

4.4 The Government will provide and maintain an AUTODIN/ Contractor Communication Network facility through which the contractor shall transmit/receive all required data and transactions (MILSTRIP/MILSTRAP) essential to the operation of a Government administered accountable storage site, i.e., receipt, storage, shipment, material identification/condition, inventory accuracy and action/transaction visibility.

4.5 Should any ECP initiated by the Government require a hardware or software change, the Government and the contractor shall require either agree that the change does not affect the warranty or shall negotiate an equitable change in the contract for the warranty.

PART 5 - Operating Hour Price Adjustment

5.1 The Projected Total Operating Hours (PTOH) shall be based on an average of (NOTE #3) operating hours per month for each installed (NOTE #2). This average operating time is projected by using the average aircraft flying time of (NOTE #3) hours per month times the (NOTE #3) hours per month times the (NOTE #2) operating hour ratio to aircraft flying hours of (NOTE #3) to 1. In the event that additional (NOTE #2) are procured pursuant to Section J entitled, "Option for Increased Quantity" (Line Replaceable Unit), it is projected that each additional installed (NOTE #2) shall have an average of (NOTE #3) operating hours per month beginning four (4) months after the date of final Government acceptance as evidenced on DD Form 250. If acceptance of a (NOTE #2) for installation is on or after the 15th of the month, it shall be considered, for purposes of projected total operating hour adjustment, to be the first day of the following month.

5.2 For planning purposes, the Projected Total Operating Hours (PTOH) for each 12 month period of all (NOTE #2) installs are as follows:

TABLE V

<u>PROJECTED OPERATING HOURS</u>	
<u>Months After Start Of Warranty</u>	<u>Projected Total Operating Hours</u>
1 - 12	(NOTE #3)
13 - 24	(NOTE #3)
25 - 36	(NOTE #3)
37 - 48	(NOTE #3)
49 - 60	(NOTE #3)

5.3 The Government will review the ratio of Actual Total Operating Hours (ATOH) to PTOH on an annual basis. The first such evaluation shall cover months 1-12 of the warranty period. If the ratio of ATOH to PTOH is greater than 95 % and less than 105%, no adjustment to the contract price CLIN NOTE 4 will be made. If the ratio is greater than 70% but less than 95%, the RIW contract price CLIN (NOTE #4) will be adjusted downward at the rate of \$ * per hour. If the ratio is more than 105 percent and less than 130 percent, the RIW contract price CLIN (NOTE #4) will be adjusted upward at the rate of \$ * per hour. If the ratio is less than 70 percent or more than 130 percent, the RIW contract price CLIN (NOTE #4) adjustment will be negotiated.

PART 6 - Data Requirements

6.0 The following reports and/or plans are required.

6.1 Repair Verification Test Procedures in accordance with CDRL (NOTE #4).

6.2 Decal Format, Application Method and Proposed Location in accordance with CDRL (NOTE #4).

6.3 RIW Data Reporting and Summary Reports in accordance with CDRL (NOTE #4).

6.4 Reporting Material Transactions Contractor Storage/ Distribution Point in accordance with CDRL (NOTE #4).

6.5 Technical Publications in accordance with CDRL (NOTE #4).

* to be proposed by contractor

- NOTE #1 - Name of system/equipment for which the RIW will be applied.
- NOTE #2 - Acronym of the system/equipment. (Unit may be used if defined by a table or reference in Part 1).
- NOTE #3 - Values to be established by program office, i.e., percentages, days, hours, etc.
- NOTE #4 - References to be identified by program office, i.e., SOW, CDRL, etc.
- NOTE #5 - If support equipment is included in the purchase, it should be included in the warranty and in the remedies if it does not operate properly and/or if it is not delivered on schedule.

SAMPLE #6

NOTE #1

MTBF VERIFICATION TEST/GUARANTEE

PART I - INTRODUCTION

1.1 The purpose of the (NOTE #1) Mean Time Between Failure (MTBF) Verification Test (VT) is to provide for a measurement of production (NOTE #2) equipment reliability in the operational environment. The contractual requirement of the VT provide for corrective action and/or settlement spares if the guaranteed MTBF is not achieved.

1.2 (NOTE #3) base(s) by mission design series will be designated by the Government at VT site(s) and all of the (NOTE #2) installed in aircraft at the VT site(s) will form the VT sample. The VT will last (NOTE #3) months, or a minimum of (NOTE #3) operating hours (at each base). The measured MTBF will be compared to the guaranteed MTBF and the difference between the two values will serve as the basis for determining the VT settlement conditions. The envisioned start date of the VT period is (NOTE #3).

1.3 Interim Contractor Support (ICS) will most likely be used between acceptance of the initial production item and the beginning of the VT. This period of ICS is intended to be a learning and adjustment phase which will provide the contractor an opportunity to acquire operational experience with the equipment and to benefit from information on equipment failure characteristics while the repair environment is contractor-controlled.

PART II MTBF VERIFICATION GENERAL TEST PROVISIONS

2.1 The contractor guarantees that the MTBF of the (NOTE #2) accepted under this contract, when measured in accordance with the provisions stated herein, shall be equal to or greater than * hours. Pending determination that the measured MTBF is equal to or greater than the guaranteed MTBF, the Government may withhold up to (NOTE #3) percent of the total dollar amount of CLIN (NOTE #3).

*Value to be supplied by contractor and shall not be less than (NOTE #3).

2.2 The (NOTE #3) aircraft conus base(s) shall be identified as the VT site(s).

2.3 The VT shall be initiated no sooner than (NOTE #3) months after Government acceptance of the first production (NOTE

#2) months and shall continue for (NOTE #3) months or a minimum of (NOTE #3) operating hours.

2.4 The VT sample shall be all (NOTE #2) installed on aircraft at the VT site(s) during the VT measurement period. (NOTE #2) includes:

2.4.1 Installed (NOTE #2) at VT site(s) at the initiation of the VT measurement period.

2.4.2 (NOTE #2) (spares) from base supply used to replace removed (NOTE #2) that fail during the VT period at VT test site(s).

2.5 Each (NOTE #2) delivered and accepted under this contract shall be equipped by the contractor with an elapsed time indicator (ETI) to permit measurement of "on" time.

2.6 Elapsed time measurement will be made on all (NOTE #2) included in the VT measurement. (NOTE #2) installed prior to the initiation of the VT period will begin elapsed time measurement at the point of the most recent installation prior to the start of the VT. The procedures to be used for recording elapsed time measurement and other information are defined in paragraphs 2.12 and 6.1 below. Removed (NOTE #2) on which the ETI is inoperable shall be included in the Total Operating Hours Accumulated (TOHA) calculation by using the average operating time per day (AOT) of (NOTE #2) was installed in the aircraft.

2.7 When an ETI failure occurs, the (NOTE #2) shall be removed and replaced by a serviceable (NOTE #2) from supply.

2.8 A VT failure is defined as:

2.8.1 Any (NOTE #2) removed from an aircraft at a VT site because of built-in-test (BIT) failure indication, a malfunction and/or a reduction in the performance of the (NOTE #2) below the requirements of the contract specification. A performance failure is defined as (NOTE #3).

2.8.2 A removal which is not subsequently determined by the Government to be one of the following allowable exceptions:

(1) The (NOTE #2) failure was due to (a) non (NOTE #2) included fire or explosion; (b) submersion; (c) acts of God, such as flood, hurricane, tornado, and earthquake; (d) aircraft crash; (e) combat action; (f) unauthorized maintenance by Government personnel (authorized maintenance is defined in paragraph 2.9 and will be further defined in the approved technical orders (TOs)); (g) damage due to accidental or willful mistreatment by non-contractor personnel; and, (h) faulty material and/or workmanship provided/performed by other than the contractor, his personnel or under his control.

(ii) Failure of the removed (NOTE #2) cannot be verified, (i.e., retest OK (RTOK) and it passes the VT repair verification test as prepared and provided by the contractor and approved by the Government). However, all such unverified failures over (NOTE #3) of (NOTE #2) removed during the VT will be counted as failures in the calculation of MTBF.

(iii) Removal due to interfacing equipment.

(iv) Removal due to ETI failures.

(v) Remove solely to accommodate any Government approved Engineering Change Proposal (ECP).

(vi) Maintaining action(s) without contractor presence or approval as defined in paragraph 2.10.a below.

2.9 Three maintenance support options are available to the Government during the VT period, i.e., Government organic, ICS, or a combination of both. The Government will perform all organizational ("O") level maintenance regardless of which maintenance support option is chosen. Also, the Government will have available one (1) intermediate ("I") level test station at each VT site by the start of the measurement period. Whether the Government or contractor operates this test station will depend upon the availability of TOs, spares, training, etc. An ICS plan covering both VT and other (NOTE #2) bases will be developed by the contractor in accordance with Statement of Work (SOW) paragraph (NOTE #3), CDRL No. (NOTE #3). The types of maintenance actions envisioned at each level of maintenance are as follows:

2.9.1 "O" level (flightline): Maintenance will be accomplished with (NOTE #2) BIT/Self-test without requiring any flightline special test equipment. When a (NOTE #2) is removed, due to BIT or degraded operation, it will be replaced with another (NOTE #2) from base supply.

2.9.2 "I" level (shop): Maintenance will be performed in accordance with TOs (CDRL No. (NOTE #3)) and is limited to the failure verification of (NOTE #2) and the removal and replacement of items (i.e., Shop Replaceable Units (SRUs), chassis components) which have been designated as "I" level replaceable. Failure verification shall be accomplished in accordance with the VT repair verification test, (see paragraph 2.8.2(ii)). Replacement items will be obtained from base supply. Unverified removals (RTOK) will be reinstalled on the aircraft or turned into base supply. "I" level maintenance of VT samples shall be conducted at the designated VT site(s) only.

2.9.3 Depot maintenance ("D" level): All maintenance actions beyond "I" level capability shall be performed in accordance with "D" level TOs (CDRL No. (NOTE

#3) or in accordance with ICS provisions in SOW paragraph (NOTE #3).

2.10 Witnessing maintenance actions:

2.10.1 The contractor shall designate and station a test representative at each VT site and depot location with the right to witness all (NOTE #2) maintenance performed on VT samples by the Government at the "I" and "D" level. Verbal notice will be given to the contractor's representative. The contractor's representative shall have eight (8) hours to appear at the applicable maintenance facility. No maintenance shall be performed on the removed unit during the eight (8) hour period unless the contractor's representative is present (or has given consent for maintenance to begin). If the contractor's representative fails to appear within the eight (8) hour period, maintenance may be performed without his presence.

2.10.2 Similarly, the Government shall have the right to witness all VT maintenance performed by the contractor. The same notice, time to respond and failure to respond within the allotted time requirements specified in paragraph 2.10.1 apply.

2.11 Maintenance at other locations: No maintenance, on failed (NOTE #2) VT samples, other than removal and replacement of the (NOTE #2) at the "O" level, shall be accomplished at any site other than a VT test site or Government/contractor depot facility. If the (NOTE #2) must be removed at another site, it shall be returned to the VT test site for maintenance or disposition. Procedures for the removal of VT samples shall be carried aboard the aircraft in the AFTO 781 Aircraft Log.

2.12 Maintenance Data Forms:

2.12.1 The purpose of the maintenance data form (Figure 2.12-1 and 2.12-2) is to record (NOTE #2) problems and related data to be used in the MTBF calculations. If the contractor fails to agree with a failure verification, the reason for disagreement shall be annotated and the Government shall document its reason for proceeding with the repair.

2.12.2 In the event the contractor's representative is not present in accordance with paragraph 2.10 and the eight (8) hour notification period has passed or been waived, the Government will complete the MTBF maintenance data form and note the absence of the contractor's representative. In this case, it shall be assumed that the contractor agrees with the Government's findings.

2.12.3 Other Forms: The MTBF Maintenance Data Form is in addition to, not in lieu of, the normal maintenance and supply forms required by the Government.

2.13 Engineering Change Proposal (ECP):

2.13.1 All contractor developed and initiated ECPs to satisfy the guaranteed MTBF (reference paragraph 2.1) shall be prepared and submitted in accordance with DOD-STD-480 and shall be identified as "NO COST VT ECP." The Government agrees that such Class I ECPs submitted by the contractor shall automatically stand as approved by the Government 45 days after receipt by the Principal Contracting Officer (PCO) unless the contractor is notified in writing of its disapproval. Disapproval of any no cost VT ECP shall, in no way, relieve the contractor of its obligations pursuant to this provision.

2.13.2 The contractor obligations, which shall be accomplished at no increase in contract price, include, but are not limited to:

(i) Engineering effort for the preparation of VT ECPs; and

(ii) Incorporating VT ECPs in all units delivered and on order under this contract; and

(iii) Changing:

(a) Technical data;

(b) Spare repair parts; and

(c) Support Equipment (SE); and

(d) Software; and

(e) Any other data or supplies necessitated by incorporation of a VT ECP, to the extent that such items were originally furnished by the contractor.

2.13.3 The contractor may, if approved in the implementing ECP, institute field changes to effect modifications during the ICS period before the VT commences. The Government shall permit the contractor to update all (NOTE #2), which are or will be installed on aircraft at the VT measurement period if such activity does not affect the mission capable status of aircraft at the VT sites.

2.13.4 Within 60 days after the conclusion of the VT, the contractor shall, at no additional cost to the Government, provide necessary modification kits and installation data to allow the Government to modify all remaining units not updated in accordance with 2.13.1 and 2.13.2 as the results of a NO COST VT ECP.

2.14 The Government shall prepare a detailed test plan to be followed during the VT period. The Government agrees to

review the plan with the contractor no later than six (6) months prior to the start of the VT.

2.15 Based upon the VT results, if the measured MTBF(M), as computed by the formula below, is less than the guaranteed MTBF(G) (referenced paragraph 2.1) the PCO will:

2.15.1 Direct the contractor to submit a "MTBF Compliance Plan" in accordance with Part III of this provision; or

2.15.2 Implement the "Settlement Spares" in accordance with Part IV of this provision.

$$\frac{\text{TOHA}}{F} = M$$

where;

M = achieved MTBF

TOHA = Total operating hours accumulated on (NOTE #2) installs at the VT sites during the VT period.

F = (NOTE #2) total failures during the VT period as defined in paragraph 2.8.

PART III - MTBF COMPLIANCE PLAN (MTBF-CP)

3.1 In the event the MTBF(M) is less than MTBF(G) at the conclusion of the VT period, the contractor will, if directed by the PCO, develop a corrective course of action which will improve the (NOTE #2) MTBF to the value recorded in paragraph 2.1. The contractor's proposed course of action will be submitted as a "NO COST MTBF-CP." All contractor efforts incurred with engineering, preparation, submission and implementations of the MTBF-CP shall be accomplished at no increase in contract price. The plan, which will include "NO COST VT ECPs" if Class I Engineering Changes are required, must be approved by the Government prior to implementation. Disapproval of the plan by the Government shall in no way relieve the contractor of its obligations pursuant to this contract.

3.2 The MTBF-CP shall be submitted no later than sixty (60) days after receipt of government notification. The plan will contain sufficient data to justify the effectiveness of proposed actions and applicable milestones for their implementation.

3.3 ECPs submitted as a part of the MTBF-CP shall be prepared by the contractor and approved by the Government in accordance with paragraph 2.13.

3.4 Upon Government approval, which is agreed to occur no later than forty-five days after receipt by the PCO, unless the contractor is notified in writing of its disapproval, the contractor shall implement corrective action(s) to include all supplies deliverable under this contract. This shall be accomplished by change and/or retrofit of delivered items and incorporation during production all remaining items to be delivered. All contractor actions shall be accomplished at no increase in contract price.

3.5 Following implementation of an approved MTBF-CP the Government will verify, through additional testing as it may deem necessary, that the MTBF(M) has achieved MTBF(G). Contractor participation in this additional testing will be accomplished at no increase in contract price.

3.6 In the event MTBF(M) is less than MTBF(G), as determined through additional testing subsequent to implementing a MTBF-CP, the contractor shall either repeat the requirements of this Part III or provide settlement spares in accordance with Part IV as directed by the PCO.

3.7 The contractor's commitment under the provisions of this agreement will continue until the guaranteed MTBF has been achieved or settlement spares are provided in accordance with Part IV.

PART IV - SETTLEMENT SPARES

4.1 In the event that MTBF(M) is less than MTBF(G) at the completion of the VT or after a period of additional testing due to implementing a "NO COST MTBF-CP" the contractor shall furnish additional spares as directed by the PCO, at no addition cost to the Government.

4.2 The objective of settlement spares is to supplement the pipeline flow of Line Replaceable Units (LRUs) and Shop Replaceable Units (SRUs) needed as a result of the lower MTBF. The PCO will determine the actual number and type of spare items the contractor must provide. The Government reserves the right to determine the type of settlement spares, i.e., LRUs, SRUs or any combinations thereof. In no event shall the actual dollar value of such settlement spare exceed the dollar value of "m" spare (NOTE #2) as computed by the formula below, where the unit dollar value is the same as the unit price for the initial production spare of (NOTE #2) (\$). The unit dollar value of SRUs selected by the Government as settlement spares in lieu of LRUs will be the same as the unit price for applicable SRUs in the Provisioning Priced Spare Parts List.

4.2.1 Settlement Spares shall be calculated using the following formula:

$$m = A \times S$$

where;

m = Number of settlement spares to be furnished
(m rounded to next higher integer)

$$A = 1 - M/G$$

where;

M = Measured MTBF (ref paragraph 2.15)

G = Guaranteed MTBF (ref. paragraph 2.1)

$$S = T + 1.65 \sqrt{T}$$

where:

$$T = N \frac{(F_b \times 6) + (F_d \times 35) + (F_c \times 365)}{F} \text{ AOT} \times \frac{A}{100}$$

where

N = Total quantity of (NOTE #2) procured as installs under the basic contract and all options (install) exercised as of the conclusion date of the VT period.

F = Defined in paragraph 2.15.2

F_b = Total (NOTE #2) failures returned to serviceable condition at base level.

6 = Base repair cycle days

F_d = Total (NOTE #2) failures returned to the depot for repair (i.e., F-F_b)

35 = Depot repair cycle days

F_c = Total (NOTE #2) failures that were condemned. (NOTE: F_c will be deducted from F_d).

365 = Procurement cycle days

AOT = (NOTE #2)

4.3 In the event settlement spares are to be provided by the contractor to the Government, the contractor shall ship such spares as reasonably possible, but no later than the number of days established in Table 1. For each spare not delivered under

this provision within the required time, the contractor will make payment to the Government at the rate of NOTE #3) per day per item for each day late. In no event, however, shall this payment be more than the unit value as determined in paragraph 4.2.

TABLE 1

<u>SETTLEMENT SPARES</u>		
<u>SETTLEMENT SPARES</u>	<u>IN PRODUCTION CALENDAR DAYS</u>	<u>OUT OF PRODUCTION CALENDAR DAYS</u>
1. LRU	*	*
2. SRU	*	*
* = To be established by contractor (NOTE: Government should establish maximum value)		

4.4 Upon determination of the type and quantity of spares due the Government, the PCO shall notify the contractor in writing as to the type, quantity and schedule for delivery in accordance with paragraph 4.2.

PART V TEST ACTIVITIES - This section describes the activities of the Government and the contractor during the VT period.

5.1 Government activities: The Government has prime responsibility for accomplishment of the VT. These activities include supervisory and maintenance functions.

5.1.1 Test Directors: The Government shall designate Test Directors at three levels:

- (i) The Program Office
- (ii) The MTBF VT test site, and
- (iii) The Depot Repair facility.

The term "Program Office" in this test plan refers to the activity assigned program management of the (NOTE #2) during the VT period.

(a) Program Office Test Director: The Test Director for the Program Office shall have overall responsibility for coordinating all aspects of the VT. He shall be responsible for the final collection of data, briefing the other test directors, and other duties assigned by the Program Office. He shall also instruct the Government's representative at the contractor's repair facility on the data collection requirements.

(b) Base Test Director: Each Base Test Director shall have the responsibility for the collection of data on base maintenance, briefing flight crews on the operation of the (NOTE #2), briefing maintenance personnel on the maintenance provisions of the VT, contractor notification and other duties assigned by the Program Test Director. To the degree possible, he shall witness all base maintenance operations performed on VT units. He shall keep a configuration log of all VT LRUs. He shall act as liaison between the base maintenance facility and the contractor's representative at the base. In the event that VT LRUs are to be shipped to the depot or the contractor's repair facility, the Base Test Director shall expedite the shipment and ensure that it is properly recorded in the configuration log. The Base Test Director shall ensure that the equipment being shipped to the contractor's facility under ICS is packaged and shipped in accordance with the TO (CDRL No.) and contains the AFTO Form 350 and MTBF Maintenance Form. The Base Test Director shall also be responsible for the monthly collection of ETI readings in accordance with paragraph 6.6.1.

(c) Depot Test Director: The Depot Test Director shall have the responsibility for the collection of data on depot maintenance, briefing depot maintenance personnel on the maintenance provisions of the VT, and other duties assigned by the Program Test Director. To the degree possible, he shall witness all depot maintenance operations performed on the VT items. The Depot Test Director shall also act as liaison between the depot maintenance facility and the contractor's depot representative.

5.2 Contractor Responsibilities: The contractor has support responsibility for the VT and shall designate and station a representative at each base and depot repair facility involved in the VT.

PART VI - DATA COLLECTION AND SPECIAL FORMS - The purpose of this section is to provide a listing of the forms that will be used to collect data or disseminate information during the VT. Additional requirements may be added by the Program Office as the test proceeds. It is the responsibility of the Test Director to see that the forms are utilized correctly.

6.1 AFTO Form 781 (Aircraft Log): Pilot complaints about equipment malfunctions are entered into the Form 781A, thus initiating a maintenance action. "O" level maintenance is also recorded on this form. A special page will be inserted in the 781 book to describe the VT equipment, data of installation of (NOTE #2) and the ETI reading at the time of installation.

6.2 AFTO Form 349: Base Maintenance data will be entered on the Form 349.

6.3 AFTO Form 350: Form 350 accompanies any test items in shipment.

6.4 MTBF Maintenance Data Form: The MTBF Maintenance Data Form is a special form that is utilized for VT items. The form is used to record the witnessing of all maintenance actions by the nonrepairing party. Use of the form is described in Section 2.12.

6.5 AFTO Form 50: Form 50 will be used to record depot maintenance action actions.

6.6 Base Configuration Log: The Program Office Test Director shall design a configuration log for use by the Base Test Directors. The log is used to track individual LRUs in order to produce a monthly maintenance summary. Entries are made in the log at the time of installation, at the time of any removals or replacements, and at the end of each month. Entries shall include the tail number of the aircraft in which each test item is installed. The LRU/Serial# is the control element.

6.6.1 Monthly ETI Readings: Each ETI shall be read once a month. The reading will be entered as part of the data for the corresponding LRU. It is the responsibility of each Base Test Director to obtain these readings for the test items at his base.

PART VII - MEETINGS - Meetings shall be held quarterly during the VT period for the purpose of reviewing the test activities/ results and will include the Test Directors and representatives from the program office, Inventory Manager (IM), contractor, and contract administration. Meetings will be held at the program office and contractor's facility on an alternating basis with the first such meeting to be held at the program office.

PART VIII - MAINTENANCE FLOW (TYPICAL)

8.1 A typical flow under Government organic maintenance support resulting from a failure is described below:

8.1.1 Pilot reports (NOTE #2) problem on AFTO Form 781A.

8.1.2 "O" level maintenance crew isolates fault and, if required, removes defective LRU from aircraft. Action is reported on AFTO Form 781A and AFTO Form 349. AFTO Form 350 is attached to LRU.

8.1.3 Contractor is notified. (Reference paragraph 2.10.1).

8.1.4 LRU failure is verified in presence of

contractor's representative at base repair facility. (Reference paragraph 2.10.1)

8.1.5 LRU is repaired by SRU remove and replace operation. AFTO Form 349 is completed and an AFTO Form 350 is attached to faulty SRU. (NOTE #2) is now available as a VT spare and is returned to base supply.

8.1.6 SRU is shipped to Government Technical Repair Center (TRC).

8.1.7 SRU is returned to depot serviceable stock and is available for issue.

8.1.8 SRU is returned to depot serviceable stock and is available for issue.

8.2 For (NOTE #2) still under ICS at VT bases, paragraphs 8.1.1 thru 8.1.5 of the above flow are the same. However, after the LRU failure is verified, the following steps apply:

8.2.1 LRU or SRU is shipped to contractor's facility along with a description of the problem on a completed AFTO Form 350, attached to the unit. Contractor notifies the Government representative that the unit has been received. (Reference paragraph 3.10.2).

8.2.2 LRU or SRU is repaired in the presence of Government representative.

8.2.3 LRU or SRU is returned to Air Force stock and is now available for issue.

8.3 Documentation at each of these steps will be collected by the cognizant test director.

MTBF MAINTENANCE DATA FORM

UNIT NAME: _____

UNIT SERIAL NUMBER: _____ ETI READING: _____ HOURS: _____

REMOVAL DATE: _____ TAIL NUMBER: _____ A/C TYPE: _____

OPERATION SITE: _____

S/N _____

FLIGHT LINE PROBLEM: (Pilot Comments, removal/install
difficulties)

BASE MAINTENANCE

Describe Failures:

Describe Corrective Action:

<u>P/N</u>	<u>MCN</u>	<u>QTY</u>	<u>CONDITION</u>	<u>DISPOSITION</u>
<u>REPLACED</u>			<u>OF PART</u>	

Figure 1 MTBF Maintenance Data Form (Side 1)

DEPOT MAINTENANCE

Describe failure verified:

Describe corrective action:

<u>PN</u> <u>REPLACED</u>	<u>QTY</u>	<u>CONDITION</u> <u>OF COMPONENT</u>	<u>DISPOSTION</u>
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GOV/CONTRACTOR PERFORMING MAINTENANCE

GOV/CONTRACTOR WITNESS

BASE _____

DEPOT _____

REMARKS:

Figure 2 MTBF Maintenance Data Form (Side 2)

- NOTE * 1 = Name of system/equipment for which the MTBF Verification will be applied.
- NOTE * 2 = Acronym of system/equipment. (Unit may be used if defined by a table or reference in Part I).
- NOTE * 3 = Information to be established by program office, i.e., time, values, references, etc.

GLOSSARY OF ACRONYMS

AFALC	Air Force Acquisition Logistics Center
ALC	Air Logistics Center
ASD	Aeronautical Systems Division
CBA	Cost Benefit Analysis
CND	Could Not Duplicate (malfunction)
DAIP	Defense Acquisition Improvement Program
DFARS	Defense Federal Acquisition Regulation Supplement
DSS	Decision Support System
ECP	Engineering Change Proposal
FMEA	Failure Modes & Effects Analysis
FSD	Full Scale Development
INS	Inertial Navigation System
LCC	Life Cycle Cost
LRU	Line Replaceable Unit
LSC	Logistic Support Cost
MAJCOM	Major Command
MDC	Maintenance Data Collection (system)
MSB	Measurable Symbols of Behavior
MTBF	Mean Time Between Failure
MTBR	Mean Time Between Removal
MTBUR	Mean Time Between Unscheduled Removal
MTT	Mean Troubleshooting Time
MCMT	Mean Corrective Maintenance Time
MTTR	Mean Time to Repair
O&M	Operation and Maintenance
ORLA	Optimum Repair Level Analysis
PCO	Principle Contracting Officer
PD	Purchase Description
PIP	PPA Implementation Plan
PMD	Program Management Directive

PPA	Product Performance Agreement
PPAC	Product Performance Agreement Center
R&D	Research and Development
R&M	Reliability and Maintainability
RFP	Request For Proposal
RIW	Reliability Improvement Warranty
ROI	Return On Investment
RTOK	ReTest OK/Return Test OK
SOC	System Operational Concept
SON	Statement of Operational Need
SPO	System Program Office
SRU	Shop Replaceable Unit
TACAN	Tactical Air Navigation
TO	Technical Order
TCTO	Time Compliance Technical Order